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GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

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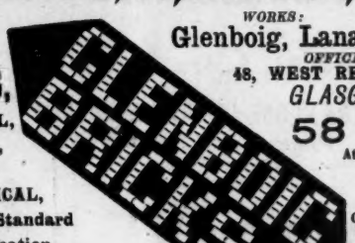

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EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON, E.C. 4.

VOL. CXLIX., No. 2956.] TUESDAY, JANUARY 6, 1920. [72ND YEAR.

EDITORIAL NOTES.

A Momentous Year for the Industry.

To our readers, advertisers, and all others who have business relations with the "JOURNAL," we heartily express the time-honoured wish—"A Happy and Prosperous New Year." It is our sincere hope that it will be so. Every one of us has had enough of the hard, rugged difficulties and troubles and the obsessing anxieties of the past few years. But though we have had enough—and more than enough—of them, they will not vanish at the mere wish that they should do so, but will need our best thought, endeavours, and energy to cause them either to dissolve or be surmounted. This year will be one which will have to be devoted largely to reconstruction. The war and what has followed have changed the whole basis upon which rests the fabric of our industrial system and material private affairs; and we have therefore to work for future prosperity under (so to speak) new laws and regulations. This applies with conspicuous prominence and force to the gas industry. For it, the current year cannot fail to be a memorable one. We are hoping that the industry will at the end of it find itself properly conditioned for the work it has before it. It may not get all it wants. In human affairs, this is a rare result. But it is not asking for more than is just and appropriate; and, with open minds and fair judgment, those with whom the power of determination resides will see that this is so. What is being asked, the industry is convinced, is also the best for the community at large; for the interests of the community and of the industry are identical.

It is going to be a momentous year for the industry, and a year for work—work that will do much to shape the fortunes of gas undertakings in the long future. A parliamentary session is spanned by a few months; to the "future" no limits can be placed. Therefore, while not neglecting ordinary affairs, there will have to be a large concentration upon the readjustment of the industry's financial conditions, and the construction of the bridge over which the industry will pass to greater freedom and greater opportunities for service, which will be to the national advantage. The duty will rest upon the responsible men of every gas undertaking to give solid and loyal support to those who will, on behalf of the industry, be taking the lead in this matter, and every responsible man can also work in assisting to dissipate local misconception and misrepresentation. Though the Board of Trade will propose, and the Government will accept, the measure for general legislation, and although the London County Council and certain other authorities have (in respect of the Beilby report) given their endorsement, the industry is not likely to have a walk-over without opposition. There will still be those who will fight tooth and nail against it obtaining justice—particularly in respect of financial revision. There will be heavy work for the National Gas Council and the Gas Companies' Protection Association. The Institution of Gas Engineers will also have to take their technical part; and the British Commercial Gas Association (while maintaining at full flow their normal work for the industry) will be looking into the proposals with a critical eye upon the riper ability they will give for trading, and so extended service. The Society of British Gas Industries will be keenly watching developments; for the provision of plant and the adapting of appliances to comply with the new conditions will claim from the members their best technical, commercial, and organizing efforts. The roots of their interests are deeply set in the gas industry; and they are not unmindful of this. Above all, there must be perfect unity, and single will and purpose. When, therefore, we speak on this occasion of a "prosperous" year, the word has a very full meaning.

Coal and Gas Prices Muddle.

THE gas engineer and manager starts his year well with one of the profoundest riddles that Government official ingenuity has ever propounded for him. It is to discriminate as to what is the right proportion of coal on which he is to claim a rebate of 10s. per ton, owing to its use for providing gas for domestic purposes as distinct from industrial, and then handing out to the consumers the difference in cost according to the rules laid down, after an individual calculation has been made for the consumers—in the case of the ordinary consumers at the end of March, and in the case of the prepayment consumers, as and when convenient during the quarter—as to what is their due in respect of the 10s. rebate dating from Dec. 1. Thus the gas revenue for the December quarter actually received will be subject to a deduction to be made for December in the January-March quarter; for the first allowance to be made at the end of March for ordinary consumers, and during the quarter for prepayment consumers, "shall take account of rebates re-"ceived or to be received on coal delivered between Dec. 1, "1919, and March 31, 1920." This additional complication might have been avoided, in view of the fact that no allowance is being made for the higher-priced coal in stock that will be used for domestic gas making, though it will have to be taken into calculation in determining the allowance to consumers.

The "Instructions" that have been issued by the Coal Controller, giving directions to gas undertakings as to how they are to proceed, do not by any means possess the property of pellucidity. We are not astonished at this. The decision as to the domestic fuel price reduction was made without due consideration of the ways and means by which the division between domestic and industrial uses was to be effected. The Coal Controller has evidently been wrestling with the problem; and the "Instructions" to gas undertakings are the best he has been able to fashion. He must forgive us saying that, difficult as we recognize the problem to be, the "Instructions" are capable of considerable improvement. In the first place, each gas undertaking is authorized, when paying for coal, to certify to the coal suppliers the quantity of coal on which it is entitled to a rebate of 10s. per ton as from Dec. 1. But the proportion of coal for last month on which rebate is to be allowed is to be determined by taking "the proportion that the gas "sold for domestic or household purposes during the third "quarter of 1919 bears to the total quantity of gas sold "during the same period." To the practical gas manager the absurdity of this will be immediately apparent; for the heaviest domestic gas-consuming month of a heavy domestic gas-consuming quarter, when both gas heating and lighting come with a rush upon gas undertakings, is given a quarter as a basis during which there is little room-heating gas consumption and (with summer time prevailing) relatively little consumption for lighting. Thus there is no sort of correspondence between the two periods. Then for the current quarter, the proportion is to be based upon the gas consumption of last quarter. There is not so much objection to this, except that the experience of the last few years is that, through colder weather, the domestic gas consumption in the first quarter of the year is much greater than during the fourth quarter. A more sensible arrangement is that which, after March, adopts the corresponding quarters of the previous year as the basis.

Another complication, however, arises. It is that the coal deliveries during December will probably have been lower

than during September; and so the domestic proportion of the deliveries (based on the gas consumption of the September quarter) will be altogether out of harmony with the proportion of coal actually used to make gas for domestic purposes. This means high-priced coal from stock. And the President of the Board of Trade made it clear in the House of Commons recently that no allowance would be made on gas coal stocks held on Dec. 1. Naturally, therefore, gas undertakings cannot, or will not, be expected to make an allowance to consumers for the proportion of coal taken from stock for the supply of domestic gas.

The "Instructions" do not give any guidance as to how to arrive at the dividing-line between domestic and industrial service. The only guide, it seems to us, that can be taken is the Household Fuel and Lighting Order of 1918, which furnishes a general classification of premises in which the use of gas is considered as being for domestic and industrial purposes. For instance, it is laid down that bakehouses, laundries, dairies, and industries carried on at home, domestic trades and farm buildings, and public lighting are industrial uses. Industries or trades carried on in the home are a puzzle. The lighting portion is considered domestic; and the use of gas for heating, power, and process work, &c., is industrial. Generally speaking, however, the gas would go through one meter. In such cases there can only be guesswork founded on inspection, which will add to the expense of management and inspection. To put the matter pointedly, there can be no clear-cut line between domestic and industrial use; and a very large amount of discretion will have to be reposed in the officials of gas undertakings. In cases of dispute, the Local Fuel Overseer's service may be found useful; but if difficulty continues, perhaps it would be as well to refer the matter to the National Gas Council in order, if possible, to obtain an official ruling.

There comes the question of the disposal to the domestic gas consumers of the sums recovered in respect of coal used to provide domestic gas. We have already referred to the times when adjustment of accounts is to be made to assure the consumers getting the benefit of the lower price paid for coal. The reduction to be made is to be at the rate per 1000 c.ft. which results from multiplying the "total" tons of coal used [for domestic gas?] in the previous quarter by 120—that is, the 10s. in pence—and dividing by the number of thousands of cubic feet of gas sold in that quarter, less a small agreed percentage in respect of expenses. The deduction for expenses, we believe, is 5 p.ct. of the total rebate; but this figure is to be subject to revision at the end of the March quarter. Where does this bring us? The Coal Controller naturally wants, in order that coal may be saved, the production of the largest amount of gas that is reasonably possible from the coal used. Therefore, under the rule laid down for the making of computations by all gas undertakings alike, where a large amount of gas is sold per ton of coal, the consumer will receive less reduction per 1000 cubic feet than where a low amount of gas is sold per ton. Where a poor gas-yielding coal has to be used, the consumer there will obtain a larger part of the 10s. than the consumer will get where a good gas-yielding and more expensive coal is employed. At the same time, the fact will supply some compensation to those gas undertakings that are making water gas and steaming charges in order to conserve coal.

No reference is made in the "Instructions" to a reduction in the price of coke. Had there been any order in this respect as predicted, it would have been impossible to have adopted the method of computation laid down for determining the rebate on gas. The Coal Controller evidently saw the difficulty; and so we assume it may be taken that the omission of all allusion to coke, and no qualification in respect of it being proposed in connection with the computation to settle the price of gas, mean that the price of coke is to be left alone. The shortage of the supplies of coal is not likely to be materially improved during the next few months; and therefore on no account should gas undertakings reduce the price of coke. In the event of there being any difficulty in local disposal, or if a reduction is pressed for by an energetic local fuel overseer, the gas undertaking concerned would do well, we think, to at once communicate the particulars of their difficulties to the National Gas Council.

With the increase in railway rates, with the wages difficulties, and higher costs in other directions, we can foresee the necessity of making an increase in the price of gas which will detract from the result of the multiplication and division sum which the Coal Controller has set gas undertakings. Then again will be seen the ravings in the Press, and be heard the shoal of questions in the House. The prayer of gas men is constantly for commercial freedom.

Has the Sliding-Scale had its Day?

THE Bill that the South Metropolitan Gas Company have deposited in Parliament invites the gas industry to reconsider the position of the sliding-scale. The questions for consideration are, Has the sliding-scale as applied to the industry had its day? and Is it suited to the conditions of the times which are radically different from those that prevailed at its inception now forty-five years ago? These questions should not be answered positively without due consideration; and we have no intention of replying to them at the moment. They are of a character that, the gas industry having so largely adopted the sliding-scale, deserve to be thoroughly threshed-out by many brains; and then (when all that can be said has been put forward) will be the time to form a definite conclusion. As things are, opinions are divided. The war has given the sliding-scale such a shock, and has revealed its weak places, that some people are quite convinced it has forfeited its right to respect, and to further reliance. Others found so much virtue in it before the war that they think it should be maintained, but on revised terms. Both are wrong in basing their opinions on too limited ground. The considerations are of an altogether broader character, and complex in their constitution. While we are readjusting our financial terms with Parliament, let the work be done in the light of experience and a full comprehension of the requirements and conditions.

The usefulness of the sliding-scale under the old conditions no one would gainsay. We would emphasize the words the "old conditions," because, apart from the influences of the war, the conditions that prevail to-day are not the conditions that prevailed at the institution of the sliding-scale; and those who are prudent will look not only at current circumstances, but will endeavour to take full measure of probable future conditions. Looking back over the forty-five years, what were the conditions existing then? The gas industry at the time had practically the whole field before it in respect of the provision, and distribution by subterranean means, of an agent for light, heat, and power, which called for little or no labour from the user. The industry was subject to practically no competition; it had a monopoly in the supply of light, and as a labour-saving agent for heat and power, though the large developments in these two latter respects were for then later days. Then, too, there were only relatively small variations in market costs—costs for raw materials and manufactured goods and for labour. All this has changed. The whole gamut of economic conditions has undergone alteration, in substance and degree, from capital provision right through to the prices that have to be charged to the consumer for the services rendered to him. The easy-going fluctuations which were so congenial to the working of the sliding-scale are altogether a matter of the past—at any rate, taking a survey of the influences which produce fluctuations, so it seems to us. How far ahead is it before finance settles down to anything like the old conditions? No one would dare hazard an answer; and few people have little, if any, hope of old financial conditions again obtaining. Then there is labour—not only labour in the gas industry, but labour outside. The last few years have seen such changes in labour organization, demand, and methods of procedure, that there is no resemblance between the conditions of to-day and those that were prevalent forty-five years ago. Everything in connection with labour generally is in uncertain and speculative case; and no one can predict how this is going to affect the costs of materials, manufacturing plant, appliances of all kinds, and conveyance. Not a single place in our industrial and commercial life can escape this uncertainty. There alone is sufficient consideration, relating both to the present and the future, to cause us to question whether there will ever be a return of times when the old smooth working of the sliding-scale will again be realized. The working will, in all probability, be something of a more fitful character, which is a condition that is to be avoided as far as possible if the good name of the industry is to be restored for providing a safe and permanent investment.

These conditions are not the only ones that bear upon the orderly operation of the sliding-scale. The gas industry

has become separated completely from the conditions that invested it with something that was called a monopoly. It has no monopoly to-day as an agent for the supply of light, heat, and power by subterranean means. It has been forced by the evolution of things to take its place in the commercial world, the same as any other commodity. It is open to competition in every branch of its operations. And the competition is going to be stronger and more extensive in the future. All the risks of open competitive trading will be intensified. The old plane upon which the sliding-scale worked has disappeared, and has been succeeded by something of an entirely opposite character, which will be emphasized and not lessened. Let us consider the position well, and with an eye on possibilities. There is the electrical industry working zealously in every field in which gas operates. We know its weaknesses, and we know its strength. Where it has weaknesses, there gas has great superiority. In the fields in which gas has superiority, there it will be subject to quantitative fluctuations of business produced by atmospheric variations, and by industrial and trade prosperity and depression. In the gas industry we have to make up our minds to variations in the amount of business done, such as have not been experienced in the past. We shall have good years and bad years. The former may reach higher peaks than ever before; the latter may show deeper valleys from the mean. We have to prepare and legislate for this. Anticipations may prove to be merely chimerical; but we do not think they will. Anyway, the new conditions will not make the working of the sliding-scale at all smoother than before. There are the secondary products. What of them? The supplies will become greatly enlarged. Bye-product recovery in the coking industry is extending. The oil people are not only shaping themselves for stronger competition, but they are exploring the processes of carbonization, and the development of our shale deposits. The low-temperature people are presenting pictures of considerable schemes. In the fertilizer market, entirely new conditions have to be faced; and these will come upon us progressively. There is not the slightest chance of sulphate of ammonia maintaining its old position. On all sides competition is threatened. All over the world there will be increased production. Some of our former overseas markets will become—have become in cases—not only producers, but competitors. The waterfalls of Norway, and the processes for the fixation of atmospheric nitrogen, are yielding considerable increases. The carbonizers of coal and the owners of the nitrogen fixation processes in Germany have entered into a covenant under which there will be mutual trading. So the British gas industry has to consider the bearing of all external changes, which will not add to the easiness of the path of the sliding-scale, but the contrary. Only numskulls close their eyes to facts and probabilities.

The primary object of the sliding-scale was to provide an incentive to business management. Perhaps a spur or an artificial inducement was required forty-five years ago under the then conditions. But is it to-day? Ponder well the question. Competition on every side and from many quarters claim to-day, and will claim more in the future, a higher standard of business acumen in the gas industry. The new economic conditions, with the sharper and more pronounced fluctuations, will need the concentration of a highly qualified business intelligence. These are not mere words; they are solid truths. Thus the "incentive" of the sliding-scale to business management is now a superfluity; and, from the point of view of an incentive, the sliding-scale may once and for all be discarded. If it continues, it can only be from the point of view of establishing by rule the relationships of gas consumers, producers, and employees of the latter. When we come to consider this point of view, the question faces, How many among the consumers even know of the existence of the sliding-scale? Whatever the number, it is absolutely certain that a lower number understand its operation. Not only consumers, but gas stock or share holders do not commonly appreciate it. Often and often at meetings we have heard a question addressed to the chair, as to why a further proportion of the balance carried forward cannot be put into the hands of the stock or share holders as dividend. In short, the sliding-scale is so foreign to all our usual commercial procedure that (outside gas administrations) its principles and effects are almost as little known as an abstruse science. During the war every sliding-scale gas company has been suspected of profiteering!

Is there not a more flexible method than the sliding-scale which will harmonize the interests of consumers, stock or share holders, and gas workers, and which will avoid the detrimental effects (such as were experienced during the war) upon the credit and fortunes of the industry? Such a method is wanted; and it is what we must legislate for. This is where the South Metropolitan Gas Company's plan invites more than passing consideration. What it submits is that we must have a basic or standard price which is fair, and which will conform with the changed economic conditions. Also that the dividend at this basic price shall be one which, while very moderate under the new conditions (bearing in mind the premiums paid for stock and shares in past times), will in future defend gas financial interests from such a "landslip" as they have had during the past few years, and from the detriment which the economic conditions in future—looking to the possibility of their being less stable than those of pre-war times—may inflict. At the same time, the plan has been constructed with a view—quite apart from the necessity of doing everything possible to lower prices in order to meet competition—to give the consumers the greater benefit from all that accrues from improved market conditions, good management, and the economies derived from new processes and more efficient methods, while allowing capital and workers equally to divide an amount (if earned) which will only represent one-third part of the sum of the price reductions consumers enjoy below the basic price. In other words, if a sum is calculated representing the price reductions on the gas sold, and one-third of this sum is added to it, then of the total the consumers enjoy three-quarters by reason of the charge for gas being below the basic price, and the stockholders and employees each take a moiety of the remaining quarter. There is an additional incentive there to good management and to the utmost economy; and the partnership in prosperity is maintained. The stockholders and the workers will lose any dividend gained above the 6 p.ct. if the basic price is again reached after it has become possible to descend below it; but investors will be more scrutinizing in the future than in the past. There will be abundant inducement to try to recover for consumers, stockholders, and employees any ground unavoidably lost. The 6 p.ct. dividend (if earned) will help to steady the credit of the industry, which has a bigger competitive career before it than it has passed through, and less secure economic conditions, and its capital requirements are likely to be considerable. It is idle to-day to talk of a "return" to normal conditions. There will be no "return." New normal conditions are being set up; but the so-called normal conditions will be of a more irregular order than of old. That is as we view the current position and the future. In these circumstances, we cannot after our experience expect the inflow of new capital into the industry unless investors can see better security than the industry has to offer under the old terms. We have got to find this added security. Will the old sliding-scale give it to us in the new circumstances? Is the South Metropolitan Company's plan an improvement? If not, what is the right one?

We have put, as briefly as possible, the position as we see it. Other men may see it differently, and be in possession of argument which has not occurred to us. We want their views and their argument. Meanwhile, there is not any definite abandonment on our part of the friendship we have had for the sliding-scale. What we want fully investigated and ascertained is, Have altered circumstances reduced its efficiency and sufficiency? Now is the time to investigate and ascertain. A few months hence, it may be—Too Late.

Shale Carbonization Developments.

THE technical men of the gas industry have interest in the developments that are taking place in the treatment of our shale deposits; and for two reasons. First, technically in connection with the retorting problems; and, secondly, because the developments will increase the production of oil and sulphate of ammonia, and so augment supplies. There is the active enterprise in connection with the Norfolk deposits, which is not the only pebble on the English beach at the moment. In the United States, too, where the shale deposits are of magnificent area, schemes are being opened up; and experimental work is afoot in devising suitable retorts for dealing with the mineral. But what is being done in Norfolk by English Oil-Fields, Ltd., is of considerable interest not only from the technical point of view, but the

commercial. It is extensive work that is there in hand. A large capital is being employed; extensive contracts for plant have been given out, much of which is the same as is in use in gas-works; and responsible men are associated with the venture. It is no particular concern of ours whether the estimates that have been published are over-generous—estimates which tell of 2000 million tons of shale being available on the Company's property, and yields of oil and sulphate of ammonia which so far exceed the average of Scotch working that the prosperity of the shale-oil industry in Scotland will, if all comes out true to prediction, have some of its burnish taken off it in comparison. Of course, there are shales and shales, there are depths and depths, and yields and yields; and these are factors in prosperity. In every respect the advantage appears to be on the side of Norfolk, and not of Scotland. This is as we read; time will show. The seams in Norfolk are at less depth than those now being worked in Scotland. The oil yield of the Scotch shales is from 25 to 30 gallons; for the Norfolk shales an average of 45 gallons is talked about—the test yields varying between 30 up to 60 gallons per ton. The sulphate of ammonia yields of some of the samples of shale are from 60 to 70 lbs. per ton; but, of course, the figure varies with different seams. There is, however, sufficient information available from the exploration already made to cause us to watch with some interest the results of actual working.

The interest is intensified when it is remembered that the steaming process in vertical retorts as practised in the gas industry has been merely borrowed from the Scotch shale-oil industry, and adapted to gas-works operations. Charge steaming in the shale-oil industry was adopted among other reasons for producing water gas from the carbon remaining in the shale, and to increase the production of ammonia by the hydrogen of the steam combining with part of the nitrogen of the shale. The steam, too, helps to sweep the oil-vapours out of the hot zone in the retorts, and so to a large extent prevent their decomposition. This shows how much the gas industry is indebted to the Scotch shale-oil industry; and the lesson is the product of the highly-skilled and scientific work that has shaped the industry's destinies. It has been found in the gas industry that carbonization of coal is more of a science than our old crude methods show it was once thought to be. We have travelled so far now in making carbonizing advances, home produced or copied, that no wise man among us would say the end is yet in view. The same in the shale-oil industry. The technical men there are still experimenting. America, large source as it is for natural crude petroleum, is working on retorts of several types for dealing with shale—the reason being that different shales require different treatment; and the Scotch retorts without modification are unsuited to the American mineral. For one thing, it is found in the States that, owing to the physical characteristics of the shale there, a mechanical agitator or stirring device is a useful addition. In some cases horizontal retorts are being tested with mechanical methods for causing the charge to traverse through them. In Norfolk we anticipate that at the outset the Scotch practice will be followed; but it is understood that the technical staff are busy in devising a retort that will not convert into permanent gas the "relatively fragile" lighter oils which are so susceptible to dissociation when over-heated.

We have said enough to show that matters are in a very interesting state in the shale-oil industry, and that, from many points of view, there is interest in it all for the men of the gas industry. Whether the Norfolk enterprise is going to turn out a commercial success, we cannot say. Those at the head have on the subject generous beliefs, to which they give expression. For perfect assurance, a balance-sheet composed of many items has to be prepared; and this can only properly be done when data have been obtained from actual working. Laboratory or small tests are only indicative, but not actually dependable as representing the achievement for working-scale operation. Experience has over and over again taught us this in the gas industry.

Lower Grade Gases.

If Prof. Dr. Strache had been living in this country, and had been studying here the developments of the utilization of coal for gas production, he could not have written a paper which better portrayed the position than that of which we give a translation to-day from our German contemporary. It only shows that, in the pursuit of economy, technical thought and practice in Austria and Germany are running on parallel lines with technical thought and practice in this country. He deals with mixed gases produced by coal and water gas manufacture, with the complete gasification of coal, and with their places in the evolution of economy. The paper is a complete ratification of current development; and Prof. Strache is a shrewd observer and investigator and a deep thinker. One reason why on the Continent there has not been an earlier development of practices now growing at a rapid rate is the necessity for effecting alterations of consumers' appliances to suit gas of different composition. In this country, an additional obstacle has been the stiff and stolid adherence of our Legislature to precedent. The inconvenience of altering consumers' appliances is an insufficient excuse for blocking economies that bring year by year increasing credit to the industry and the country. The war has taught the gas men of Germany and Austria the same lesson that it has taught the gas men in this country, that there is economy and advantage in the supply of mixed gases of lower calorific grade, providing calorific value, specific gravity, and so forth are constant; and, where constant, it is the common experience that consumers are better satisfied than they were in times when there were upward fluctuations in the degrees of carburetting and calorific quality, which are a distinct disadvantage. Dr. Strache points out that mixed coal and water gas has a superiority; for though the heating value is reduced, flame temperature is increased, and therefore so is the candle power per B.Th.U. The increase in flame temperature attained by the higher velocity of combustion undoubtedly has in most cases, a favourable effect, and compensates for the reduction of calorific power. Dr. Strache is no believer in distributing unavoidable nitrogen and carbon dioxide; and, as in this country, he is looking to development producing lower prices, and the sale of heat units instead of cubic feet. In all these matters, we are in perfect accord with Dr. Strache.

Piping Cheap Gas along Railways.

We can well understand that, railway companies being large consumers of gas, would like to possess the power of taking a supply from an undertaking selling at a relatively low rate, and piping it for use in other parts of their system, though in the areas of other gas-supply undertakings. We can, on the other hand, also well understand that gas undertakings into whose areas such gas is brought would have a strong objection to their areas being invaded, their rights assailed, and a good account lost. In every town railway companies have excellent customers in the gas undertakings; and therefore they should maintain, and not attempt to destroy, their mutual business relationships. The Great Northern Railway Company, however, in the Bill they have deposited in Parliament, are proposing to obtain power to transmit and use on any portion of their railway and property gas, water, and electrical energy, no matter whether the transmission and use are outside the area of the suppliers. The clause contemplating this is given in the portion of our review of Gas Bills published to-day. It is not at all likely that the proposal will receive the heartiest welcome in the industries concerned; and in all probability there will be very active and formidable opposition.

Higher Railway Goods Rates.

From Jan. 15, new railway goods rates will come into operation; and the gas industry will feel them. But the gas industry, which is asking that its finances be placed on a sound basis, cannot expect the railways to be run at a loss. At the same time, it will hope that every possible economy will be introduced on them by the Ministry of Transport that will effect as early as can be a reduction in the cost of working. When the railways are being run at a loss of nearly 50 millions a year, this must be recovered somewhere; and the only means of recovery is to charge prices that will counterbalance the expenses of conveyance, and give the capital employed a reasonable rate of dividend. The increased charge for the carriage of coal, coke, and patent fuel—25 p.ct., with the addition of a flat-rate of 3d. per ton—will mean a rise in the price of coal varying throughout the country from approximately 6d. to 2s. per ton. The new rates will, of course, affect pig iron, steel, manufactured goods, secondary products, and everything else that the gas industry buys and sells which has to rely upon railway carriage. But this cannot be helped in present circumstances. Some useful extracts from the new schedule of rates are given in our news columns.

Railwaymen's Wages.

The Government and representatives of the National Union of Railwaymen have come to an agreement on the question of the standardization of the rates of pay of the different grades of workers other than locomotive men, whose rates of pay were settled some time since. Whether the men will accept the scheme remains an open question. There are at the moment some signs of discontent over it. Whether, too, the increase in the railway rates for the carriage of materials and goods have taken into account the new advance in the men's wages is also not known; but it cannot be supposed the Government settled the former without taking into account the latter. However, briefly put, there is to be an increase by 5s. of the sum added to the average pre-war weekly rate of pay—making it 38s. This will continue definitely until Sept. 30 next. Then the combined sum is to be subject to a reduction or increase of 1s. per week for every fall or rise of a full five points in the cost of living. The permanent standard rates are to represent, generally speaking, at least 100 p.ct. increase on the average pre-war rates; and however great may be the decline in the cost of living, the rates of pay for any grade are not to fall below the permanent standard rates.

The Moulders' Strike Nearing its End.

There will be relief throughout the engineering industries at the provisional agreement that has been reached in the moulders' strike, which has had such a disastrous effect throughout the country. The gas industry among others has had its work held up, and its supplies of manufactured goods seriously curtailed through this piece of gross obstinacy over an inflated demand. The men wanted an addition of 15s. to their wages; they are to have what they might have got in the early days of the dispute—5s. increase per week, which is the allowance granted under the recent engineering award. The matter is to go to ballot; but there is every expectation that the men will take the advice of their leaders, and that work will be resumed on Jan. 19. The strike has already lasted upwards of fourteen weeks. The funds of the Union have been depleted; the 50,000 moulders on strike have lost heavily in wages; they have thrown out of employ some 250,000 workers in dependent trades; and the work of other industries, and trade generally, has had to bow to the insensate and autocratic methods of these men. At the same time, valuable lessons are being gained by the trade unions, though they are not the lessons they wanted.

Rising of the Rates.

The outstanding feature of the 1919-20 issue of the annual rating statistics compiled by Mr. W. Allison Davies, the Borough Treasurer of Preston, is the extent by which the rates levied have risen practically throughout the whole list—a fairly representative one, comprising large and small, manufacturing and residential, inland and seaside, towns in all parts of the kingdom. With costs in every direction going up, an increase in rates and taxes is unavoidable; but the actual amount of the increase in many cases should be sufficient to arrest the attention of even the most casual observer. Time was—and that, too, not so very long ago—when there were not a great many towns mentioned in the list where the rates exceeded 9s. in the pound; now a total which is below this figure is the exception rather than the rule. Indeed, as will be seen from the reference that is made to the statistics in our news columns to-day, on the present occasion, out of about 140 towns, in no less than 100 the total rates levied exceed 10s. in the pound; while in four towns they amount to 15s. or more in the pound. Merthyr Tydfil heads the list with the enormous figure of 17s. 5d., with West Ham a good second at 15s. 7d. This compares with about 80 places in the immediately preceding returns with rates of 9s. or over in the pound, and 40 in the list for the year preceding that. The position is, of course, very much better than this in many instances—and there are still to be found some towns in which to live (and pleasantly situated ones at that), where the rates stand at less than 8s. in the pound. But the situation generally is an unpleasant one from the point of view of the ratepayers, some of whom must be considering how long it will be before a figure of 20s. in the pound is reached in their particular district. If things continue to "progress" at the same rate in the future as they are shown to have been doing by comparison of the rates levied in 1918-19 with those for 1919-20, this stage will very soon be reached in certain places. Increases in the period named of 2s., 2s. 6d., and even more, in the pound are frequent throughout the list; but it must be hoped that this pace will not be maintained throughout another twelve months. Putting Greater London aside for the moment, it may be mentioned that six Metropolitan Boroughs are included in the statistics, and that in not one of these do the total rates levied exceed 10s. in the pound. There are, in fact, two boroughs in which they are less than 9s. Mr. Davies is performing a useful service in calling attention in this way to a matter which is of importance to all of us.

Middle Class Union and Others.

Watch the movements of the Middle Class Union in connection with the proposals for new gas legislation. If the Union is out for justice and progress, it will assist the gas industry; if not, it may work on the side of the opposition. The organization of local authorities not owning gas undertakings has been having a private conference over the Beilby report, the amended proposals of which the London County Council have endorsed.

Coal Prices and the Sliding-Scale.

Attention is drawn to a slight error in the leaderette published last week relating to the above subject. The New South Wales Act, to which it refers, provides that the standard price of gas shall be varied by 1d. per 1000 c.ft. for every 1d. variation in the cost of production and distribution, and not one shilling, as mistakenly stated.

The Institution "Transactions."

The Secretary (Mr. Walter T. Dunn, F.C.I.S.) has been prompt in editing and getting to press the 1918-19 volume of "Transactions" of the Institution of Gas Engineers, a copy of which was received from him last week. It is on this occasion, too, a bulky volume of nearly 600 pages, embracing reports of the two special general meetings in June and October, 1918, as well as of the annual general meeting last May. The record is one of strenuous work on the part of the President—our old friend Mr. Samuel Glover, of St. Helens, an excellent portrait of whom forms a frontispiece to the book. The memoirs again, unfortunately, include the names of men who in their time did good work for the industry to which they belonged. The section containing abstracts of papers published in various chemical journals between July, 1918, and June, 1919, prepared by Mr. S. E. Whitehead, B.Sc.Eng., F.C.S., comprises twenty pages of useful information

Absorption Process for Recovering Gasoline.

With the aid of a large number of illustrations, there are described at length by Mr. W. P. Dykema, in Bulletin No. 176 of the United States Bureau of Mines, recent developments in the absorption process for recovering gasoline from natural gas. It gives the results of a study conducted by the Bureau for the purpose of informing the petroleum industry on the work that has been accomplished in this direction. It is said that throughout the United States the improvements in the absorption process that are under consideration by engineers not only widen practice so as to include gases at all pressures and percentages of gasoline content, but seem to be developing definite standards as to various points; and it is felt that, though perfect practice has by no means been attained, a description of what is being done—including those obviously more efficient features that each plant has developed and uses at one or another stage of treatment—will be of value. The importance of the subject in the United States is seen from the fact that in 1917, 886 plants, of a daily capacity of 902,385 gallons, produced 217,884,104 gallons of gasoline, of a value of $40,188,956. The estimated quantity of gas treated was 429,287,797,000 c.ft.; the average yield of gasoline per 1000 c.ft. of gas being 0·508 gallon. The production of gasoline from natural gas by compression and vacuum methods, and by the absorption method, for the years 1916 and 1917, is given in tables, which show that the quantity of gas treated in 1917 was more than double that of 1916, and that most of this increase was from gas treated in absorption plants. The author expresses the view that eastern as well as western districts will undoubtedly show a steady increase in the production of gasoline from gas, because of the larger volume of gas being treated and the increased efficiency of the plants.

Manchester District Institution Jubilee.—The jubilee of the Manchester District Institution of Gas Engineers will be celebrated on Thursday, Feb. 26, when (according to the preliminary programme of which particulars have been forwarded by the Hon. Secretary, Mr. G. S. Frith) there will be at 11.30, in the Midland Hotel, Manchester, the fiftieth annual meeting of the Institution, under the presidency of Mr. A. E. Mottram, of Ossett. The new President, Mr. E. H. Hudson, of Normanton, will deliver his Inaugural Address; and Sir Dugald Clerk, the President of the Institution of Gas Engineers, will be present. There will be a subsequent luncheon,

PERSONAL.

NEW WORK FOR MR. W. G. HEAD.

Among the changes the New Year brings is the transference of the services of Mr. W. G. Head, from the office of Superintendent of Mains of the South Metropolitan Gas Company, to the firm of Messrs. Humphreys & Glasgow, in connection with whose plants his special line of work will be of an advisory character among gas undertakings. Mr. Head leaves the South Metropolitan Company accompanied by the utmost goodwill and best wishes for his future success; and these wishes will be heartily shared by many friends. Mr. Head has had a varied experience; and this is not the first association he has had with Messrs. Humphreys & Glasgow, for he was at one time superintending for them the erection of carburetted water-gas plant. He was also in the early part of his professional career with Messrs. James Simpson & Co. Then from 1901 to 1905, he was in the drawing office and on the Old Kent Road works of the South Metropolitan Company, during which period the carbonizing plant was reconstructed and other new plant installed. The following year saw him in North Carolina taking part in a mission on behalf of the Company in connection with monazite sand; and then until 1910 he spent his time first as Chief Assistant Works Superintendent at Old Kent Road, and subsequently as Chief Assistant Engineer at Vauxhall and Kennington Oval works under Mr. A. F. Browne. It was in 1910 that he was appointed Mains Superintendent to the Company. The distribution system comprises 1500 miles of mains; and there was some heavy work in connection with this system before the war, through alterations and diversions necessitated by tramway constructions, and the laying of steel mains for high-pressure work. In 1916-17 he was also filling the position of Engineer to the West Greenwich Gas-Works. Simultaneously with the other engagements, he took part in war work from 1915—first as the South-Eastern District Manager of the Metropolitan Munitions Committee; then as Director of Works in connection with the Inventions Department of the Ministry of Munitions; and in 1917-18 he was transferred to the Gas-Works Section of the Explosives Supply Department under Mr. W. Doig Gibb—being placed in charge of the sub-section dealing with gas-works priorities, and the supply of gas to munitions factories. Since the armistice, he has been engaged in assisting in demobilizing several large explosive factories. Now energies are to be devoted (as already mentioned) on the technical side of the business of Messrs. Humphreys & Glasgow; Mr. Head commencing his new duties on the 1st prox.

We understand that Dr. W. B. Davidson, who resigned the engineership of the Nechells Gas-Works of the Birmingham Corporation over four years ago to take up the position of Chief Chemical Engineer with the new firm of British Dyes, Ltd., of Huddersfield, is going into partnership early this year with Dr. A. C. Michie, who has already established an important connection as a Consulting Chemical Engineer in Newcastle-on-Tyne and district. The partnership will be conducted under the name of Michie and Davidson, Consulting Chemists, No. 12, Akenside Hill, Newcastle-on-Tyne.

Mr. Ernest J. Hobbs has resigned the position of Engineer and Manager to the Sittingbourne District Gas Company (which he has held for the past two-and-a-half years), in order to join the staff of the Woodall-Duckham Company, Ltd.

Mr. Samuel Hands, the Engineer and Manager of the Harwich Gas Company, has been appointed to the position of Engineer and Manager of the Sleaford Gas Company, and will take up his duties as from March 31, when, as intimated in the "Journal" recently, Mr. Harry Wimhurst's retirement takes effect.

Mr. William Fish, A.C.I.S., Secretary of the Aldershot Gas, Water, and District Lighting Company, has been appointed (from a large number of candidates) Secretary to a Guildford firm of manufacturers. Mr. Fish has, we learn, been at Aldershot for the last eight years, and was previously engaged as confidential assistant to the Secretary of the South Staffordshire Mond Gas Company.

The Rt. Hon. Sir Horace Brooks Marshall has been elected a Director of the Commercial Gas Company, in succession to Sir T. F. Victor Buxton, Bart., who died a few months since. Sir Horace Marshall, who has been Lord Mayor of London, appears in the New Year's Honours list as having been appointed Knight Commander of the Royal Victorian Order.

Among those whose names are included in the New Year's Honours list, Sir Richard T. Glazebrook, C.B., F.R.S., late Director of the National Physical Laboratory, has been promoted a K.C.B.; and Sir Henry Birchenough, K.C.M.G., who is a Director of the Imperial Continental Gas Association and of the Continental Union Gas Company, has had conferred upon him a baronetcy, in recognition of valuable services rendered to the Ministry of Reconstruction and the Board of Trade.

Mr. Joseph Knott, the Accountant to the Sunderland Gas Company, has been presented by the officials with a token of esteem, to commemorate his fifty years' service with the Company. Mr. Norman S. Cox (Secretary) presided at a gathering in the Board-Room, and Mr. W. I. Wood (Cashier), who has been associated with Mr. Knott for 41 years, made the presentation, which took the form of a canteen of cutlery suitably inscribed. The recipient was heartily congratulated by his fellow officials upon his long service, and good wishes for Mr. and Mrs. Knott's future good health were enthusiastically expressed. Mr. Knott, in acknowledgment, spoke of the good feeling existing among the whole of the staff and between the Directors and the officials. He gave some comparisons between now and the conditions fifty years ago, when he entered the service of the Company as a junior. The total staff in the Fawcett Street office in those days was five, of whom he was the sole survivor. The works had extended, various departments unthought of in the early days had been created, the output of gas had increased sixfold, while the wages bill was now seventeen times that of 1870. Yet to-day there was one thing unchanged—the same goodwill and comradeship existed, not only among the members of the various departments, but between the staff and their respective heads. He was the third to complete fifty years' service with the Company. Their late respected chief, Mr. J. H. Cox, completed sixty years' service, and Mr. J. Grant (Distribution Superintendent) 51 years, while Mr. J. G. Kitts had 49½ years to his credit.

OBITUARY.

Mr. William Nisbet, Manager of the Ballymena Gas-Works, who has passed away after a short illness, was son of Mr. James Nisbet, ex-Manager of the Portadown Gas-Works. His first position as Gas Manager was at Aughnacloy (co. Tyrone), after which he spent six years in a similar position in Clones, and then nine years in Monaghan. He took over the Ballymena managership eighteen years ago, and effected many important improvements in connection with the works. Just lately he had on hand a scheme to replace the present horizontal retorts with a bench of verticals.

The death has occurred of Mr. John D. Moneypenny, Accountant in the Gas Department of the Belfast Corporation. He had been in Corporation employment for forty-two years, and his work in the branch mentioned was marked by the highest ability and efficiency.

The funeral of the late Alderman John Henry Neal, J.P., of Barrow-in-Furness, took place on Saturday, amid many manifestations of regret. The deceased had been a member of Barrow Town Council since 1897; and after serving for seven years as Vice-Chairman of the Gas and Water Committee, he was elected Chairman in 1909, and retained the position until his death last Tuesday night, at the age of 70. During his chairmanship, not only were improvements carried through at the gas-works, but branch works were established in the Salthouse district.

GOOD WISHES FROM THE SOCIÉTÉ TECHNIQUE

To the Institution of Gas Engineers.

The following expressions of goodwill appropriate to the season have been exchanged by the Presidents of the Société Technique de l'Industrie du Gaz en France and of the Institution of Gas Engineers.

Sir Dugald Clerk, President of the
Institution of Gas Engineers,
39, Victoria Street, Westminster, S.W.

Mr. President and Dear Colleague,—

I take the opportunity which the Christmas Season offers me to send you, in the name of the Société Technique de l'Industrie du Gaz en France, our best wishes for the prosperity of the Institution of Gas Engineers.

May the year 1920 bind still more the bonds of friendship which unite us.

Kindly accept, Mr. President and Dear Colleague, the expression of my most sincere regards.

The President,
Dec. 20, 1919. (Signed) H. Laurain.

Monsieur H. Laurain, President of the
Société Technique de l'Industrie du Gaz en France,
12, Rue de Clichy, Paris.

Dear Mr. President and Colleague,—

On behalf of the Institution of Gas Engineers, I reciprocate the kind wishes expressed by you in your letter to me, and wish you and the gas industry of France a most prosperous continuation of a career of great utility to your splendid country.

May our Institutions long continue to act in amity, aiming at sound and honest work for our respective countries.

I am, Dear Mr. President,
Yours very sincerely,
(Signed) Dugald Clerk,
President of the Institution of
Dec. 30, 1919. Gas Engineers.

Next Saturday afternoon there will be a visit by members of the London and Southern District Junior Gas Association to the Old Kent Road works of the South Metropolitan Gas Company, at the main gates of which they will assemble at 2.30. There will be a business meeting at the Westminster Technical Institute on Friday evening, the 30th inst., when Dr. Hartley, of the Richmond Gas Stove and Meter Company, Ltd., will give a lecture (illustrated by lantern slides) on "Coal Gas in Industry."

TEMPORARY INCREASE IN CHARGES ACT.

FURTHER applications have been made to the Board of Trade for Orders under the Statutory Undertakings (Temporary Increase of Charges) Act, 1918, by the

Arundel Gas Company.
Crossgates, Halton, and Seacroft Gas Company.
Freshwater Gas Company, Ltd.
Heathfield and Waldron Gas Company, Ltd.
Herne Bay Gas and Electricity Company.
Market Drayton Gas Company.
North Pembrokeshire Gas and Water Company.
Otley Gas Company.
Pudsey Coal and Gas Company.
Tonbridge Water-Works Company, Ltd.
Weston-super-Mare Gas Light Company.

The Board have, it is intimated, made Orders under the Act in favour of the

Barnstaple Gas Company.
Bexhill Water and Gas Company.
Bungay Gas-Works.
Dronfield Gas-Light and Coke Company.
East Worcestershire Water-Works Company.
Farnham Water Company.
Hawkhurst Gas Company (Second Order).
Ilfracombe Gas Company.
Kirkham Gas Company.
Lampeter, Llandyssul, Tregaron, and Aberayron Gas Company.
Mirfield Gas Company.
Southgate and District Gas Company.
South Kent Water Company.
Tottenham District Light, Heat, and Power Company.
Twyford (Berks) Consumers' Gas Company.

The Board have issued notices varying the prices which may be charged under Temporary Increase of Charges Orders granted to the

Dowlais Gas Company.
Alliance and Dublin Consumers' Gas Company.

The Ministry of Health have made an Order authorizing the Arlecdon and Frizington Urban District Council to increase their maximum charge from 5s. to 6s. per 1000 c.ft.; the Cleator Moor Urban District Council, from 4s. 7d. to 5s. 6d. per 1000 c.ft.; and the Cockermouth Urban District Council, from 4s. to 6s. per 1000 c.ft.

THE TEN SHILLINGS REDUCTION ON DOMESTIC COAL.

Instructions to Gas Undertakings How to Obtain the Rebate, and How to Dispose of It.

1. Under the provisions of Clause 5 of the Coal (Pit's Mouth) Prices Order and Direction, 1919, gas undertakings are authorized, when paying for coal, to certify to the suppliers of the coal the quantity of the coal on which they are entitled to the rebate of 10s. per ton, which quantity shall be determined as follows:

(*a*) In the case of coal delivered during December, 1919, the proportion of coal on which the rebate is claimed shall be the proportion that the gas sold for domestic or household purposes during the third quarter of 1919 bears to the total quantity of gas sold during the same period.

(*b*) In the case of coal delivered between the 1st of January, 1920 and the 31st of March, 1920, the proportion of coal on which the rebate is claimed shall be determined as above, but based on the quantity of gas sold during the fourth quarter of 1919 instead of during the third quarter of 1919.

(*c*) In any subsequent periods the proportion of coal on which the rebate is claimed shall be determined as above, but based on the quantity of gas sold during the corresponding quarter of the previous year.

2. The sums so recovered from suppliers of coal shall be dealt with as follows:

An allowance shall be made to each domestic or household consumer at the end of each quarter in the case of ordinary consumers, or during the quarter as may be conveniently arranged, in the case of automatic consumers, which shall be at the rate per 1000 c.ft. which results from multiplying the total tons of coal used in the previous quarter by 120—*i.e.*, 10s. in pence—and dividing by the number of thousands of cubic feet of gas sold in that previous quarter, less a small agreed percentage in respect of expenses.

The first allowance in the case of the ordinary consumers shall be made in respect of the gas consumed during the first quarter of 1920, and during the quarter as may be suitably arranged to automatic consumers, and shall take account of rebates received, or to be received, on coal delivered between the 1st of December, 1919, and the 31st of March, 1920.

3. Any surplus or deficiency shall be carried forward to the next quarter.

Dec. 24, 1919.

CITY AND GUILDS OF LONDON EXAMINATIONS.

Prize Winners for 1919.

THE report for the session 1918-19 of the Department of Technology of the City and Guilds of London Institute contains a list of the prize-winners in the 1919 examinations, in which the following names appear.

GAS ENGINEERING.

First prize, Final (silver medal).—Thomas Arnold Clare.
Second prize, Final (silver medal).—Robert Dex Holgate.
First prize, Grade I. (bronze medal).—Alexander David Young.
Second prize, Grade I. (bronze medal).—Roy Summerson.

GAS SUPPLY.

First prize, Final (silver medal).—Francis John Bengough.
Second prize, Final (silver medal).—Thomas Harold Prater.
First prize, Grade I. (bronze medal).—Richard Adams Gretton.
Second prize, Grade I. (bronze medal).—Arthur Knight Collinge.

GAS FITTING.

First prize, Final (silver medal).—Albert George Cooper.
Second prize, Final (silver medal).—George Clements.

COAL TAR DISTILLATION.

First prize, Grade I. (£1 10s., Salters' Company, and bronze medal).—Louis Hunter.
Second prize, Grade I. (£1, Salters' Company, and bronze medal).—Malcolm Cuckney.
Third prize, Grade I. (bronze medal).—Clarence Harris.

COKE AND BYE-PRODUCTS MANUFACTURE.

First prize, Final (silver medal).—Alfred Cordon Nelson.
Second prize, Final (silver medal).—Thomas Whittaker Lovett.
First prize, Grade I. (bronze medal).—Eric Baden Shaw.
Second prize, Grade I. (bronze medal.—Dennis Wilson Capewell.
Third prize, Grade I. (bronze medal).—Edward Clough Tonge.

SPECIAL PRIZES.

GAS ENGINEERING, GAS SUPPLY, AND GAS-FITTING.

The prizes offered by the Society of British Gas Industries were awarded as follows:

Gas Engineering.—First prize, £3 3s., Thomas Arnold Clare; second prize, £2 2s., Robert Dex Holgate.

Gas Supply.—First prize, £3 3s., Francis John Bengough; second prize, £2 2s., Thomas Harold Prater.

Gas Fitting.—First prize, £3 3s., Albert George Cooper; second prize, £2 2s., George Clements.

COKE AND BYE-PRODUCTS MANUFACTURE.

The prizes offered by the Society of British Gas Industries were awarded as follows:

Final Examination.—First prize, £3 3s., Alfred Gordon Nelson; Second prize, £2 2s., Thomas Whittaker Lovett.

GAS BILLS FOR 1920.

[First Article.]

TO-DAY a beginning is made with the review of the Bills which have been deposited in Parliament, and which concern the gas industry. Since the notices were published, the Commercial Gas Company have withdrawn their proposed Bill, and so have the Sunderland Corporation. In our issue for Dec. 23 [p. 661], there were given the clauses of the South Metropolitan, the South Suburban, the Wandsworth, Wimbledon, and Epsom, and the Brighton Companies' Bills, which bear upon the making of and charging for gas on the heat-unit basis and financial revision. In our editorial columns to-day, there is an article treating of the question of the sliding-scale.

The BLACKPOOL CORPORATION are proposing an extension of the borough boundaries so as to include the urban district of Thornton, and the area at the westerly side of the borough. From the appointed day (April 1, 1921), the limits of the Corporation for the supply of gas are to include the added areas. The powers and privileges of the Corporation in relation to the supply of gas, it is proposed, shall be subject to all the like duties, liabilities, and obligations as apply within their present limits. This involves the taking-over by the Corporation of the gas-works of the Thornton Council; and the former reserve to themselves the right to continue to use the Thornton gas-works lands. The prices of gas to be charged in the area for the first year after the appointed day are to be those charged by the Thornton Council in the year immediately preceding, unless these prices are below cost. Then the prices to be charged by the Corporation after March 31, 1922, are to exceed those charged to consumers for a corresponding supply in like circumstances within the existing borough: For a period of five years by 10d. per 1000 c.ft.; and for three years thereafter, by 5d. per 1000 c.ft. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, & Co.*]

The BRIGHTON AND HOVE GAS COMPANY, in the preamble to their Bill, show that the capital raised amounts to £543,945, and the premiums to £69,219. These make £613,164; and as the total sum authorized is £687,625, there is a balance of £74,461 remaining to be issued. The debenture stock issued amounts to £112,920

out of an authorization of £145,000. The Company submit that it is expedient that they should have conferred upon them powers to enable them to sell or supply gas, wholly or in part, on a heat unit basis, or on a method or principle calculated with reference to the heat units, or the declared heat units, in the gas supplied, in accordance with any provisions for such sale or supply which may be made available for, or applicable to, gas undertakings in the present or any future session of Parliament, and that the Company should be empowered to provide and establish any plant, machinery, or apparatus, and to apply the funds of the Company in or for such purposes. It is also submitted that, owing to circumstances arising out of the war, the cost of the production of gas has been very largely enhanced, and it is expedient that the provisions of the Act of 1910 relating to the price to be charged by the Company for the supply of gas should be amended. Reference is also made to the increased capital cost of carrying on the undertaking, and to the expediency of having powers to raise further money, and additional authorization regarding the raising of money for which sanction already exists. Turning to the clauses, the first thing sought is authority to raise £100,000 of additional capital. A little later on a clause appears which removes the limit of dividend on any preference capital hereafter created, and provides for a dividend at such rate as the Directors may determine at the time of the creation thereof. The borrowing powers are to be in the proportion of one-third part of the additional capital; and it is asked that previous borrowing authorization shall also be raised to one-third. Provision is made for the issue of redeemable preference shares or stock or debenture stock. It is proposed that the standard price shall be raised to 4s. 9d. per 1000 cubic feet. But from Jan. 1, 1920, in the outer areas, prices can be charged which may not exceed that charged within the inner area by more than (the areas are duly specified) figures running from 3d. up to 1s. 3d. per 1000 c.ft. The prepayment meter clause suggests an extra charge of 1s. 3d. for meter and fittings, and 1s. 6d. if a stove is included. For the hire of a prepayment meter without fittings, the extra maximum charge is to be 8d. per 1000 c.ft., or 15 p.ct. on the cost of the meter, whichever shall be the higher. Passing over a number of more or less ordinary clauses, we come to one side-headed "Directors' Fees." In this it is provided that section 17 of the Brighton and Hove Gas Act, 1881, as amended by section 7 of the Act of 1915, shall be read and construed as if the words "together with a sum calculated at the rate of ½d. for each 1000 c.ft. of gas sold by the Company in the year in respect of which such fees are paid" were inserted therein in place of the words "so long as the dividend does not exceed 5 p.ct. per annum on the original capital, and £200 per annum in addition for every 1 p.ct. dividend above 5 p.ct. per annum paid upon the original capital," and as if the provisions of section 15 of the Act of 1910 relating to an increase of the fees of the Directors had ceased to have effect. The clause as to the heat-unit basis is as follows:

> The Company may take any steps which the Company may consider expedient to enable the Company to sell or supply gas wholly or in part on the heat basis, or on any method or principle calculated according or with reference to the heat units or declared heat units, in the gas supplied by the Company, which may be made available for, or applicable to, gas undertakings under any Act passed in the present or any future session of Parliament, and may apply any funds of the Company for such purposes.

Provision is included to enable a profit-sharing scheme to be carried out, with the election of employee directors. [*Parliamentary Agents: Messrs. Sherwood & Co.*]

The COVENTRY CORPORATION have a Bill which deals with many subjects. Among other things, they are proposing to extend the limits of the supply of gas, and to make other provision regarding the gas-works. In the preamble, there is an estimate of the financial requirements; and two of the items are: For the purchase of land for, and in connection with, the gas undertaking, £18,000; and for the erection of buildings and plant for gas-works purposes, £250,000. The proposed extension of limits is to Binley, Walsgrave-on-Sowe, and Wyken. The land it is proposed to acquire adjoins the existing gas-works at Foleshill. Sanction is sought to the stopping-up of portions of certain existing public footpaths, and to open-up substitutions. A standard calorific power of 450 B.Th.U. is sought, with a minimum pressure of 15-10ths. Clauses are included authorizing the supply of power gas. For the £18,000 required for the purchase of land, the Corporation ask for sixty years as the period for repayment; and for the £250,000 for buildings and plant, forty years. The Corporation propose to take power, if they think fit—instead of carrying to the credit of the general district rate the net surplus remaining in any year of the revenue received by them, and the annual proceeds of the reserve fund, when amounting to the prescribed limit—to apply the whole or any portion thereof to any of the purposes of the undertaking, including the formation of a fund for working capital, provided the fund so formed shall not at any time exceed a sum equivalent to one-half of the gross annual revenue of the undertaking. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, & Co.*]

In a Bill promoted by the GREAT NORTHERN RAILWAY COMPANY, there is a clause to the effect that the provisions of sections 18 to 23 of the Railway Clauses Consolidation Act, 1845, shall for the purposes of this Act extend and apply to the water and gas mains, pipes, and apparatus of any local authority, and shall be construed as if "local authority" were mentioned in the sections in addition to "company and society," provided that any penalties recovered under section 23 shall be carried to the fund of the local authority to which their revenues in respect of water or gas (as the case may be) are appropriated. A clause which will probably raise considerable opposition is the following:

> Notwithstanding anything contained in any Act or Provisional Order of or relating to the Company or any local authority, company, body, or person supplying gas, water, or electrical energy (in this section referred to as "the undertakers"), the undertakers may supply, and the Company may take and convey, or transmit to, and use on any portion of their railway or property, gas, water, or electrical energy supplied to them by the undertakers whether the place of such user be within or beyond the limits of supply of the undertakers giving the supply, and may lay down, place, and construct upon any part of their undertaking mains, pipes, cables, wires, works, plant, and apparatus for, or in connection with, such taking, conveyance, or transmission, and user.

There are no other clauses affecting gas undertakings. [*Parliamentary Agents: Messrs. Dyson, Bell, & Co.*]

The Bill promoted by the HALIFAX CORPORATION contemplates a considerable extension of the borough, so as to include the borough of Brighouse, the urban districts of Queensbury, Shelf, Hipperholme, Southowram, Elland and Greetland, and other places; and this will involve the taking over of all the rights, property, and liabilities of the authorities in the added areas. In the part of the Bill referring to the gas undertaking, nearly all the clauses are ordinary in modern legislation. The first one proposes that, notwithstanding anything contained in section 11 of the Act of 1855, the Corporation shall be entitled to charge for gas a rate not exceeding 6s. per 1000 c.ft. A clause regarding secondary product manufacture includes the one-third purchase restriction. The prepayment meter clause is on the usual terms—no addition being made to the extra charges allowed. [*Parliamentary Agents: Messrs. Lewin, Gregory, & Anderson.*]

The MAIDENHEAD GAS COMPANY are asking for power to purchase compulsorily (within a period of four years) a piece of land in the parish of Taplow, measuring 3 to 4 acres, for gas-works purposes. [*Parliamentary Agents: Messrs. Sherwood & Co.*]

The MASHAM DISTRICT COUNCIL have deposited a Bill in which they propose to purchase the local Gas and Electricity Companies. The Masham Gas Company, Limited, which was formed in 1858, has a capital of 300 shares of £5 each, of which £1370 has been issued and paid-up. The Electric Supply Company was formed in 1914, and has an authorized capital consisting of 500 ordinary shares of £1 each, and 1500 £1 preference shares, the whole of which has been issued. Of £500 of debentures, £440 has been issued and paid-up. All usual provisions appear to enable the Council to carry on the works, including the residuals clause with the one-third purchase restriction. The charge for gas is limited to 6s. per 1000 c.ft. The prepayment meter clause has been varied by 1s. being named as the maximum extra charge for meter and fittings, and 1s. 6d. if a cooker is included. For a meter without fittings the maximum extra charge of 8d. is named, or 10 p.ct. on the cost. The minimum pressure of gas is put at 15-10ths; and the calorific power standard at 500 B.Th.U. But "nothing in this Act shall exempt the Council or their gas undertaking from the provisions of any General Act relating to the supply of gas which may be passed in this or any future session of Parliament." The remaining gas clauses are of the ordinary form. And this applies also to the electrical provisions. Authority is asked to the borrowing of the amounts necessary for the purchase of the two undertakings; £500 of working capital is also required for each concern; and power is sought to borrow additional money with the sanction of the Ministry of Health. The periods of repayment asked for are: For the gas-works purchase money, thirty-five years; for the electricity works purchase money, thirty years; for working capital, ten years; and for money borrowed with the approval of the Ministry of Health, such periods not exceeding sixty years as the Minister may sanction. [*Parliamentary Agents: Messrs. Baker & Sons.*]

The NEWTOWNARDS DISTRICT COUNCIL, in a General Bill, are asking for the right to charge not exceeding 8s. 4d. per 1000 c.ft. of gas, and for power to vary prices according to the purposes for which the gas is to be used. The prepayment meter clause is in the usual terms, except that, instead of the 10d. or 1s. (as the case may be), a charge may be made at the rate of 10 p.ct. on the cost whichever may be the higher. The Council are proposing to saddle themselves with a standard of calorific power as high as 540 B.Th.U., but provision is made for revision after five years if anyone interested desires. The minimum pressure of gas is put at 15-10ths. The other clauses are of normal character; but it is noticed that "any person who, without having previously received the express authority of the Council, lights any street lamp provided by the Council, or turns on the gas in such lamp, and allows it to escape therefrom, shall be guilty of an offence within the meaning of section 70 of the Towns Improvement (Ireland) Act, 1854, and shall be liable under the Act to a fine not exceeding 40s." The Council ask for power to borrow £50,000 for the construction of additional gas-works, repayable in thirty-five years. [*Parliamentary Agents: Messrs. Martin and Co.*]

Members of the Midland Junior Gas Association will on Saturday afternoon inspect the Saltley Gas-Works of the Birmingham Corporation—assembling at the works offices, Duddeston Mill Road, at 2.30. The meeting arranged for the 15th inst. with the electrical engineers has been postponed until a later date.

ELECTRICITY SUPPLY MEMORANDA.

OUR old friend Mr. George Wilkinson, the Electrical Engineer at Harrogate, is charmingly unorthodox. He ought to have known that it is against one of the canons of electrical engineers with a kink in their brains to acknowledge that the gas-engine as a prime mover has sufficient virtue in it to commend it for any purpose—especially as being worthy of a place at the head and front of the operations of the electrical industry. But he does so in a serious attack that he makes, in a couple of articles in the "Electrical Review," on the lines of the super-stations that have been proposed to assist the country in the two-fold object of providing a cheaper and more efficient supply of electricity, and of assisting in the conservation of our coal resources. Building his opinions upon what has so far been published, he, like many other electrical engineers, is suffering from grave misgivings as to the proposed super-stations fulfilling their designed objects. Certainly so far as the curtain has been lifted on what is proposed, the stations show little imagination. They are simply to be conglomerations of plant, very much upon the lines approved for the ordinary town electric station; and, in Mr. Wilkinson's considered judgment (which again harmonizes with that of many other engineers), it is quite possible that the necessary capital expenditure for distribution alone will serve to nullify all the alleged economical advantages of super-station practice. He assumes that plant will be erected to extract the valuable bye-products from the coal, and that the resultant gas, coke, and possibly heavy oils will be used for steam production. Though these refinements will result in better economy in the super-stations than is obtained in many present-day stations of smaller size, the whole position calls to mind the case of a man who labours diligently to stop the little leak at the spigot, while he loses sight of the huge leakage at the bunghole. In the case of the proposed Nottinghamshire super-station, it is stated that when the full equipment is reached, at an estimated cost of over 14 millions, the works will consume 1500 tons of coal a day, and will require no less than 14 million gallons of cold water per hour for condensation purposes. This means that the works must be situated on the sea-board or on the banks of a mighty river. For what purpose? Solely to destroy an immense amount of heat. Mr. Wilkinson illustrates this by pointing out that, with as high as 20 p.ct. efficiency, of 5000 tons of coal used, 1000 tons will be lost in producing steam, 3000 tons will be thrown into water, and 1000 tons only will appear in the shape of useful electric energy. In other words, 20 p.ct. will be lost in the boiler-house and 60 p.ct. in the cooling water. On looking at these figures, Mr. Wilkinson finds it difficult to maintain a claim to cheap electricity supply, or to a wise use of our precious coal resources. And this is the best that is contemplated from the super-stations.

Criticism of the Super-Station.

The 20 p.ct. efficiency is only likely with super-stations when fully developed, and working under the most favourable conditions, which is a point not to be overlooked. Mere transference from present stations to super-stations is not at once, or perhaps at any time, going to bridge-over the difference between the average 6 or 7 p.ct. efficiency of these times and the 20 p.ct. efficiency attainable in the most propitious circumstances, and then only when the load on the plant has developed to the right dimensions. Many electrical engineers merely consider how they are to increase the efficiency at the stations. Mr. Wilkinson discusses not only how this is to be done, but how profitable use can be made of a proportion of the heat that is wasted. He advocates dispensing with the boiler-house and condensers—the former by utilizing some form of internal combustion engine in place of the steam-turbine, and the latter by supplying the waste heat to meet public needs. In the case of both gas and oil engines of good design, operating under proper working conditions, it will be found that a useful efficiency of upwards of 30 p.ct. can be easily obtained. Thus for generating sets of equal output, an increased efficiency round about 10 p.ct. may be realized as compared with super-station steam-driven sets for the same amount of fuel consumed. Mr. Wilkinson does not mention the possibilities of the Still engine. However, ordinary gas and oil engines dissipate about 30 p.ct. of the heat of the fuel through their cylinder jackets into the cooling water, and 35 to 40 p.ct. in the spent gases exhausted to atmosphere. This loss represents two-thirds of the total heat of the fuel consumed. But this dissipation of heat proceeds in such a way that at least 60 p.ct. of it can be recovered, and be usefully employed for industrial, public, and domestic purposes in substitution for large quantities of coal at present used for precisely the same work. To sum up, useful electrical generation with internal combustion engines is 30 p.ct. against 20 p.ct. for super-stations working under favourable conditions; and the heat that can be recovered and distributed represents over 20 p.ct. Thus for every 5000 tons of fuel consumed, there is a useful employment of 2550 tons of fuel in the case of the internal combustion engine, with heat distribution, against 1000 tons in the case of the steam-turbine plant. It will be seen from this that, to recover and usefully employ the waste heat, the idea of the super-station would have to go, and central local stations would have to continue. Mr. Wilkinson has yet to be persuaded, apart from the utilization of waste heat, that it will not be cheaper to convey coal than to go in for a costly electrical distribution scheme. We invite him to go further back (as he is so keen upon the conservation of coal), and inquire whether it would not be possible to utilize the coal that is carbonized at the local gas-works for the production—through the coke, or producer gas made from the coke—of the steam required for electricity generation. There is scope here for considerable developments, which would cause a reduction in the combined quantities of coal carried to any locality for gas and electricity generation, and which might (if some suitable means were found) lead to the utilization of the hot coke direct from the retorts, and so secure further heat efficiency. This is an idea that Mr. E. W. L. Nicol, A.Inst.E.E., put forward some time ago in our columns [see "JOURNAL," April 10, 1917, p. 55; and June 19, 1917, p. 576].

Methods of Securing Greater Thermal Efficiency.

This brings us to Mr. Wilkinson's proposal for the disposal of the recovered waste heat. He looks at what is being done in America, and cites Detroit, where in 1917, in an area 2½ miles long and half-a-mile wide, 1769 million pounds of steam were sold particularly for heating buildings and for cooking and water-heating purposes. Mr. Wilkinson, however, prefers to substitute for the steam the distribution of hot water, having a sensible outgoing temperature corresponding to a pressure exceeding that necessary to raise the water to the highest point in the distribution network, and in no case less than (say) 240°—10 lbs. gauge pressure. Simple and reliable methods are available, it is mentioned, for holding up the circulation in each building until the temperature of the water at the outlet has dropped to (say) 100° Fahr.; and a further point is that some of the best known makers of internal combustion engines are quite ready to design them to furnish heated water as a bye-product. Obviously there are weaknesses in the scheme. A heavy capital expenditure is necessary to provide a distribution system from which the heat losses would not be considerable. Then, as long records show (and this has been particularly manifest during recent times), electricity stations are subject to mishaps. In such events, it would be necessary to bring into use gas or oil fired calorifiers to prevent interruption of the supply of the hot water. These would have to be established as a stand-by. Furthermore, house heating would be discontinued during the summer, and there would be the surplus heat to be disposed of. Mr. Wilkinson is of opinion that business for this might be obtained during the summer through cooking, water heating, &c. But experience shows that people are not keenly in favour of alternative methods for seasonal use. Those who use gas, coke, or coal for cooking and water heating in the winter would not be particularly willing to engage in some other scheme for doing just the same work in the summer months. Mr. Wilkinson does not support his plan by any cost figures for comparison with existing methods. What about the cost of cooking by gas and heating water by gas or coke, not overlooking the gas-producing developments (per ton of coal) that are proceeding in gas-works, further facilities for which the gas industry is promised through the Board of Fuel Research report, and the scheme the Board of Trade are proposing to place in a Bill before Parliament? To be commercially successful, Mr. Wilkinson's hot-water scheme must be something superior in respect of cost to methods for doing the same work *in situ*. These are matters that would require serious consideration before any commitments were made. However, Mr. Wilkinson holds that the best electrical progress lies in the development, on the lines he has indicated, of electric stations adjacent to the supply area, with generating units up to (say) 10,000 H.P. Finally, another suggestion is made by Mr. Wilkinson. One of the wisest courses that the Government could adopt, he says, would be to appropriate a portion of one of the many millions they are proposing to spend on super-power stations for the purpose of setting-up model works equipped with internal combustion plant. It would be easy enough for the experts to evolve plans for putting-down plant for both oil and gas consumption. In this electrical business, the Government have gone along blindly, and have accepted the ideas of two or three men which would lead to an irrevocable stereotyping of electrical practice, without ascertaining whether there are other methods which would do what Mr. Wilkinson desires—produce cheaper electricity, and at the same time put to use with advantage a larger proportion of the potential heat value of the fuel employed.

Disposal of the Waste Heat.

The "Electrician" has a note on the restrictions of electricity supply that are taking place up and down the country. It regards this necessary step as unfortunate just at the time when great efforts are being made to place the trade of the country once again on a sound foundation, and to increase production to the highest possible figure. Our contemporary absolves electricity supply engineers from all blame. But we cannot overlook the fact that munitions work is not now here, and that the supply that was used for this purpose is available for other use. Where therefore there is a deficiency of supply, it means that either the plant is not being worked so efficiently as before, or that connections have been made in excess of the capacity of the plant. The fault for the latter

Compulsory Supply Restrictions.

undoubtedly rests with the engineer. Those engineers have been wise who have declined to be parties to putting any demand upon their plant in excess of that which it can satisfy. Hackney, St. Pancras, Birmingham, and Bradford are named as examples. We referred to some others last week. The difficulty of obtaining extra plant is alluded to by our contemporary; the cost of doing so under the new conditions is not. Certain it is that capital charges will now ascend considerably in relation to new business, and the business now available beyond plant capacity. Our contemporary is not able to give much advice that will relieve the situation. Where there is deficiency, display and other more or less luxury uses of electricity should, in its opinion, be prohibited. "The real trade of the country is of more importance than the provisions of blazing shop windows or glaring and ephemeral displays of bad illumination." Such prohibition would not go far towards compensating for deficiency. But every little saving assists at peak load. If the Coal Controller arranged to supply coal containing less ash, it would also help some stations.

Premature Rejoicing.

Those members of the electrical press who have thought proper to deride Lord Moulton for the action he took in the House of Lords in opposing the Electricity Supply Bill will, if they wish to fall into line with the major opinion in the electricity industry, have to revise their views, and own-up to having been mistaken. On Dec. 19, after the vital parts of the Bill, excepting the one creating the Electricity Commissioners, had been removed, Mr. E. Garcke, whose name takes such an honoured place in the industry, wrote to the technical press giving the view that some acknowledgment should be expressed to those members of the industry who had laboured so assiduously and successfully to get the Bill amended. There seems to have been a remarkable change of attitude of many of the supporters of the original Bill. It was a big, novel scheme; and many minds were made up before any adequate consideration had been given to the proposals. Some of them, we now learn from Mr. Garcke, are expressing unfeigned satisfaction with the drastic amendments that have been effected; and soon it will be impossible to distinguish between those who supported the Bill in its original form and those who made gallant efforts to get it into a shape less prejudicial to the future of the industry. He mentions in this connection Mr. Highfield and Mr. Wordingham. With his recollection of all previous electrical legislation, Mr. Garcke cannot remember an Electrical Bill which has met with such general and spontaneous opposition as this last one. The Bill as amended by the Government is limited to the appointment of Commissioners, with powers to examine and explore the whole situation. They will have no compulsory powers, and the confiscatory clauses of the Bill as it left the Commons are deleted. "It remains to be seen whether the industry will be able to take full advantage of the measure of freedom now promised to it." But, Mr. Garcke, how long is this measure of freedom going to last? If the statements of the Home Secretary and the Minister of Transport, and a paragraph in the King's Speech at the prorogation of Parliament mean anything, the Government do not regard what they have done as an amendment of the Bill, but simply a postponement of part of their original plans, which they intend to see fulfilled. The Government appear to appreciate what Mr. Garcke has indicated—that opposition has grown, and not diminished.

Old Lamps Made New.

When an electric lamp has lost in efficiency to such an extent that it has to be renewed, it means the purchase of a new lamp at the price paid for the one displaced. Now we see that the Aladdin Renew Lamp Corporation, Ltd., has devised a system whereby the defective parts of a metallic filament lamp can be renewed, and the interior of the bulb be cleaned. The works of the Company are in the Harrow Road; and others are being erected at Birmingham. The Harrow Road establishment is stated to be equal to an output of a million renewals per annum; but at present from 30,000 to 35,000 lamps per month are being revivified. An account of the process has appeared in the "Electrician;" but though we are informed that all the material required is the filament wire, two small springs, and a little nickel wire, it seems to us that the amount of labour involved is a far more important contributor to the expense of renewal. To give an idea of the cost, the restoration charge for each 200-300 volt lamp is 2s. 3d.; whereas a new lamp will cost 3s. 6d. There is a saving of 1s. 3d. per lamp; but whether efficiency and life will correspond with a new lamp is not known. The Company claim that in both respects the restored lamps are superior to new ones; but, to employ a phrase often used during the war, "this statement must be accepted with some reserve." The ability to continue to make a profit will, of course, depend upon the maintenance of the price of new lamps. The cost of electric lamp renewal is distinctly in excess of gas-mantle renewal.

Association of Statutory Inspectors of Gas-Meters.—The Hon. Secretary (Mr. F. Coe, of Nottingham) notifies that the members of the Executive Committee will meet in Manchester on Friday, the 16th inst., when they will be received by members of the Justices Meter-Testing Committee, and the equipment of the testing-station will be inspected. Luncheon as the guests of the Justices Committee will be followed by a business meeting, when the desirability will be considered of asking the Board of Trade to receive a deputation from the Association.

THE COAL SITUATION IN GERMANY AND ITS BEARING ON THE GRADE OF GAS.

By Dr. KARL BUNTE, of Carlsruhe.

THE report in the "JOURNAL" of the 16th ult. (p. 603) of the annual general meeting of the German Association of Gas and Water Engineers contained a brief summary of the paper, on the "Coal Situation in Germany," which Dr. Karl Bunte (son of Prof. Hans Bunte) read before the meeting. The following is a fuller summary of the contents of this instructive paper.

At the time of the revolution in Germany, it was thought that among the questions which would be solved by State measures would be that of the gasification of all coal before combustion, with recovery of bye-products, and that the combustion of raw coal would be prohibited as a barbarism. This presumption took it for granted that all coal was suitable for gasification, and that henceforth there would be no shortage of coal for gas-works. Nevertheless, gas-works are still short of coal, and the presumption that any coal can be used by gas-works has been shown to be false. Gas-works at the present time are suffering both from the bad quality and the insufficient quantity of their supplies.

SOURCES OF COAL SUPPLIES IN GERMANY.

Before the war, about 2½ million tons of English coal were used on German gas-works, against 8½ million tons of German coal. The loss during the war and subsequently of this English coal, representing about 23 p.ct. of the supply of gas coal, has had to be made good from German sources. Almost the whole of South Germany was supplied with gas coal from the Saar district; and according to the Peace terms this district passes out of German hands for thirty years. South Germany, therefore, now depends on the other German coalfields. The Upper Silesian coalfield, which supplied the east and north-east of Germany, will also, according to the Peace terms, largely pass from German control. In future German requirements must be met from the Westphalian or Ruhr coalfields, which are the largest of all, supplemented by the Lower Silesian and the Saxony supplies. This assumes that imported coal will scarcely be available. Of the total production of pit coal in Germany in 1913, about 60 p.ct. came from the Westphalian district, about 10 p.ct. from the Saar, about 24 p.ct, from Upper Silesia, and about 6 p.ct. from Lower Silesia and other districts. Before the war, however, only 3·3 to 3·5 p.ct. of the Westphalian coal went to gas-works, compared with 11 to 12 p.ct. of the Saar coal raised, 9 to 10 p.ct. of the Upper Silesian coal, and 5 p.ct. of the coal raised in the other districts. The lost coalfields were the richest in gas coal, and supplied the cleanest material. Before the war, the total coal carbonized at German gas-works was divided between the various sources of supply as follows: Upper Silesia, 32 p.ct.; Westphalia, 27 p.ct.; Saar, 15 p.ct.; Lower Silesia, Saxony, &c., 3 p.ct.; and England, 23 p.ct. While, therefore, the ceding of the Saar district only diminished the total coal production by 10 p.ct., it diminished the supply of gas coal by about 20 p.ct. Thus an increase on the Westphalian yield by 50 p.ct. would not in itself make good the loss of gas coal from the Saar district, as the coal from the new pits would be less suitable for gas manufacture. Apart from imports, the German gas manager has therefore to reckon with a permanent shrinkage in the supply of gas coal, and a permanent reduction in its quality.

THE COAL OUTLOOK.

In regard to remedies, it has been suggested that if the coal supplies are socialized the coke-ovens should be allowed only coal for the production of metallurgical coke, thereby liberating for gas-works coal now coked in ovens for more general use. It is argued that it is better to transport coal for the manufacture of gas and coke rather than transport coke only. It remains to be seen whether the Imperial Coal Office will, by taking this view, settle whether the German coal supply is in reality socialized or monopolized. A second remedy lies in the extension of the importation of English gas coal. If it is assumed that the difficulties in regard to her own coal supply with which England is grappling will be solved in the near future, it may be anticipated that gas-works accessible to sea transport will again be supplied with English coal, also that the Upper Silesian mines will again deliver coal to Germany. In both these cases, however, Germany would not be independent of other people.

It is abundantly clear that for a long time to come gas coal will not be available in its former ample quantities and of its former quality. The present shortage of coal has compelled gas-works to reduce the calorific value of the gas, which, apart from other consequences, has led to great and unrecoverable losses in the use of gas for lighting purposes. The former standard of quality—viz., 5000 to 5200 calories per cubic metre (524 to 545 B.Th.U. gross per cubic foot of gas at 60° Fahr. and 30 in.)—is no longer observed, and, as a rough average, the quality at the present time may be taken as 4300 calories per cubic metre (450 B.Th.U. gross). Many works are supplying gas much below this quality. It is imperatively necessary, if the industry is not to suffer irreparable injury, that a return should be made as soon as possible to a determined standard of quality, and measures should be taken to settle what this standard should be in future. It is not

Germany alone which has to weigh this question; England and Switzerland are greatly concerned with it at the present time.

THE NEW CONDITIONS OF GAS SUPPLY.

It must in any case be long before a sufficient supply of good gas coal will admit of a return to the old calorific power. All branches of industry are suffering from the coal shortage, labour troubles, and rising prices; but for most works all that matters is that their competitors are subject to like conditions. With the gas industry, however, it is different, because electricity supply has suffered considerably less from the coal shortage. It is therefore essential for the gas industry that sound working conditions should be re-established without delay. The great limitation of the quantity of gas at disposal compels many gas-works to transfer consumers for lighting purposes to the electricity undertaking, and to limit their own activities to the supply of gaseous fuel. The want of uniformity of the gas supplied hinders the adaptability of consumers' apparatus for its consumption. The conclusions which may fairly be drawn from the present position may be stated from three points of view:

(1) The interest of consumers demands primarily ample supply of a gas which can be used satisfactorily with the existing apparatus, while new apparatus which will utilize the gas with the fullest economy must be constructed.
(2) In the interest of economy of fuel as a whole an increase of the heat units delivered in the gaseous form must be achieved without any sensible diminution of the total fuel available.
(3) The interest of the gas undertakings demands that the gas shall be producible and shall be sold at an equivalent price per unit of heat.

The consumer's first demand being for an unlimited supply of gas, as coal gas can be supplemented by water gas produced from coke, it is only necessary to regulate the consumer's apparatus to adapt it to the consumption of the new grade of gas. According to experience and tests already made, it would appear that there is a critical phase at a calorific power of about 4000 calories per cubic metre (419 B.Th.U. gross). The quantity of gas obtainable from the coal is more than doubled if this grade is substituted for the former grade; and the heat units delivered in the form of gas are about one-and-a-half times as many. Consumers' appliances, once adjusted to this lower grade of gas, are less sensitive to fluctuations in quality than apparatus adjusted for gas of higher grade. The efficiency of cookers, fires, and water-heating apparatus is, if anything, slightly higher provided the gas consumption per hour is adjusted for the new grade of gas. This has been proved on the largest scale by recent experiences.

SUGGESTED NEW GRADE OF GAS.

The construction of new apparatus designed to give the most favourable results with the new grade of gas depends on certain physical and chemical constants. Besides calorific power, these constants are: The specific gravity, the air required for combustion, and the velocity of combustion, which determines the shape of the flame and is dependent on the composition of the gas. If gas of 4300 calories per cubic metre (450 B.Th.U. gross) is taken as the standard, and it is accepted that the non-combustible gases must not exceed 12 p.ct. (which is a matter of great importance), various technical methods and raw materials may be utilized for the manufacture of such a gas.

Methods and raw materials, and the different classes of gases which are technically producible therefrom, are considered from this standpoint in detail, and calculations are made of the proportion of two or three of these gases which yield a mixed gas having the calorific power of 450 B.Th.U. gross, incombustibles not exceeding 12 p.ct., specific gravity between ·450 and ·485, and 3·75 to 3·85 volumes of air needed for the combustion of one volume of the mixed gas. The gases considered for the preparation of a mixed gas fulfilling these requirements are: Two grades of coal gas (600 and 571 B.Th.U., and 5·6 and 6 p.ct. of incombustibles); lignite or brown-coal gas (319 B.Th.U., and 27 p.ct. of incombustibles); blue water-gas (287 B.Th.U., and 10 p.ct. of incombustibles); Mond gas (162 B.Th.U., and 57·5 p.ct. of incombustibles); producer gas from coal (144 B.Th.U., and 60·9 p.ct. of incombustibles), and producer gas from coke (83 B.Th.U., and 74 p.ct. of incombustibles).

Mixtures which fulfil the stipulations are—*e.g.*, 52·3 p.ct. of the richer coal gas with 47·7 p.ct. of blue water gas; 57·8 p.ct. of the poorer coal gas with 42·2 p.ct. of water gas; 56·8 p.ct. of the richer coal gas with either 7 p.ct. of producer gas or 5 p.ct. of flue gases, the balance being blue water gas; and a similar mixture containing about 62·6 p.ct. of the poorer coal gas instead of 56·8 p.ct. of the richer coal gas.

The effects on the yield of gas and heat units per ton of coal, and on the consumption of gas and the yield of saleable coke, of a change from the pre-war German standard of calorific power (524 B.Th.U. to a standard of 450 B.Th.U.) are next considered. It is assumed that the reduction of calorific power is effected by the addition of water gas made from coke. The coal carbonized is taken as yielding 11,550 c.ft. per ton of gas of 570 B.Th.U. gross; the consumption of coke in the retort furnaces as being 16 p.ct. by weight of the coal carbonized; and the coke consumption in water-gas manufacture as being (including boiler fuel) 70 lbs. per 1000 c.ft. of gas of 288 B.Th.U.

It is shown, on these assumptions, that the manufacture of mixed gas of 524 B.Th.U. gives 20 p.ct. more gas and 10 p.ct. more heat units (in the total gas) per ton of coal entering the gas-works than are afforded by the manufacture solely of coal gas of 570 B.Th.U.; while the manufacture of a mixed gas of 450 B.Th.U. gives 75 p.ct. more gas and 38 p.ct. more heat units (in the total gas) than the manufacture of coal gas solely, or 46 p.ct. more gas and 25 p.ct. more heat units than the manufacture of mixed gas of 524 B.Th.U. For heating and cooking purposes, the consumption will increase in proportion to the reduction in calorific power from 524 to 450 B.Th.U.—viz., to 1160 c.ft. in place of 1000 c.ft. But for lighting purposes it has been clearly shown by numerous tests in various places that with appropriate burners the same duty is obtainable per cubic foot. The effective output of a works per ton of coal entering it should therefore be increased by a figure lying between the 46 p.ct. increase in gas output and the 25 p.ct. increase in output of heat units—say, by one-third of its effective output with gas of 524 B.Th.U.

(To be continued.)

NITRATE POSITION AND PROSPECTS.

Synthetic Nitrogen.

DEALING in their half-yearly report with the position and prospects of nitrate of soda, Messrs. W. Montgomery and Co., Ltd., express the opinion that for the next two or three years producers will not have much to fear from synthetic competition, whatever may occur afterwards. The demand for nitrogen in all quarters of the globe is very great, and must be so for a long time to come. At present it is greater than the supply; and so no difficulty presents itself to producers of nitrate in following in the wake of increased costs of production. They can see no hindrance to producers going full steam ahead, though even they doubt if it will be possible to keep up with the demand. New and expanding markets are pointed to, "which are not likely to ever again be closed;" and it is asked whether, when Germany likewise begins seriously to import, there may not be a greater demand than the producers can grapple with. An interesting account is given in the report of the steps taken to secure the adherence to the Association of Producers of firms representing 17 p.ct. of the production; and it is stated that the Association, having by these means greatly strengthened their hands, began to see their way more clearly to adopt a progressive policy in the matter of price. After the original heavy sales (to bring in the recalcitrant ones) at 9s. per quintal, the figures became 9s. 4d. and 9s. 6d. for ordinary and refined, and then went upwards by stages to 11s. 6d. and 11s. 9d., which were practically the values at the close of the year. In the freight market, prices have been well maintained at from 250s. to 230s. per ton for steamers to Europe, according to port of discharge; but at the close of the year there were signs of easiness in the markets, and perhaps 200s. to 190s. may be quoted as the nearest rate for January-February loading by steamer. The production for the past twelve months is put at 1,615,000 tons compared with 2,815,000 tons in 1918. Exports from Chili were 823,000 tons, against 2,874,000 tons in 1918. The stocks in Chili now amount to 1,610,000 tons, which compares with 800,000 tons twelve months ago.

Reporting on the same subject, Messrs. Thomson Aikman, jun., say that a review of the fertilizer trade during the past year indicates that the necessity of returning nitrogen to the soil in the form of chemical manures is becoming more apparent to agriculturists; and a larger application throughout the world seems probable in the future. Consumption during the past year has been regulated by the supply, and not by the demand, as throughout the quantities available have been inadequate. Prices have ruled abnormally high, and are likely to remain so for the coming season; but the profitable figures realizable for agricultural products are likely to result in the demand again being insufficiently met. The scarcity of shipping will result in a materially smaller quantity of nitrate of soda being available in consuming markets than might otherwise have been disposed of. The production of sulphate of ammonia has shown a considerable falling off in Europe, which has not been counterbalanced by the increase in America. Synthetic nitrogen products are in much shorter supply than might have been anticipated, having regard to the great increase in their production—especially in Germany—during the war. The firm say, however, that the high cost of labour and coal make it evident that a comparatively small percentage of these war plants can be at present worked as commercial propositions for the supply of fertilizers. In fact, it is doubtful if the increase in the production of synthetic nitrogen products to-day, when compared with 1914, much exceeds the reduction in the output of sulphate of ammonia in Europe in the same period. It is stated in the report that, of the present stock of 1,610,000 tons of nitrate of soda in Chili, it is estimated that 1,250,000 tons has been sold and had freight arranged for shipment during the first four months of this year, while the remainder has been disposed of for later shipment, as it was thought the shipping facilities at the nitrate ports would not admit of the whole quantity being got away in time for this consuming season. The deduction is that actual quantities available in the consuming markets (including their present stocks) during the next six months are likely to be about 1,700,000 tons. It is remarked that the ruinous rate of exchange in Germany makes it improbable that anything approaching the pre-war quantity will be imported there during the next season, owing to the low maximum prices fixed by their Government for home-grown produce. Had it not been for this,

there is every evidence that Germany would have endeavoured to purchase large quantities, as it is generally reported that their increased supply of atmospheric nitrogen products is at present no more than sufficient to counterbalance the reduction of their home production of sulphate of ammonia. A most encouraging feature for the future of the industry is the rapidly increasing consumption in some countries that have hitherto been only small consumers of nitrate. As to sulphate of ammonia, the firm say the production is now estimated at about 380,000 tons in the United Kingdom, 300,000 tons in America, and 250,000 tons in Germany, as compared with 425,000 tons, 150,000 tons, and 500,000 tons respectively in 1914.

CITY AND GUILDS OF LONDON INSTITUTE.

Work of the 1918-19 Session.

THE first matter dealt with in the report of the work for the session 1918-19 of the Department of Technology of the City and Guilds of London Institute is the scheme for the reorganization of the examinations. Under this scheme (the full text of which is given in the report), with certain exceptions which do not concern "JOURNAL" readers, no Grade I. examinations in two-grade or three-grade subjects will be held in England and Wales this year. In three-grade subjects, candidates who have passed in Grade I. in a previous year will be able this year to take the examination in Grade II. In 1921 the Final examination only will be held at centres in England and Wales. In Scotland, Ireland, India, and the Overseas Dominions, candidates will be able to enter in all grades of all subjects as before. It is stated in the report—which is signed by Mr. Morton Latham, M.A. (the Chairman of the Technology Committee) and Mr. L. G. Killby (the Superintendent of the Department)—that this impending change, which was duly announced last February, has been adopted with a feeling of anxiety; and, as a matter of fact, there have since been received by the department numerous letters of protest against the discontinuance of the lower-grade examinations. Some teachers have pointed out that these lower-grade examinations have always proved a very valuable stimulus to students of technical subjects. Views on the effect of the new scheme when it comes into operation are invited by the department.

It seems that a considerable number of men rejoined technical classes on demobilization; and there were numerous requests for permission for such men to enter for examinations for which they were not eligible according to the regulations. The fairness of the request was recognized by the Committee; and men over 21 years of age who had been prevented from entering for the lower-grade examinations by reason of their service with the forces were permitted to enter for examination in any grade of a technological subject, irrespective of whether they had previously passed in the lower grades. The total number of candidates in technology examined during the past session at centres in the United Kingdom was 8523, compared with 7405 in 1918 and 23,119 in 1914. The percentage of candidates successful in passing was 61·3; the figure for 1918 being 63·8 p.ct.

The prize winners in the examinations in gas and allied subjects will be found on p. 21 of this issue. The department tender their thanks to the livery companies and trade societies who continue to take advantage of the Institute's examinations to encourage students by the offer of prizes, and "are gratified, by the evidence afforded by their offers of prizes, that the Institute's examinations are regarded, by those who can speak with knowledge and experience, as a valuable feature in the technical training of artisans and others." Mention is made of the fact that the prizes in "Coke and Bye-Products Manufacture" will in future be awarded by the Coke-Oven Managers' Association, who have arranged with the Society of British Gas Industries to undertake the award of prizes previously given in the subject by the latter Society. Particulars of the various prizes to be offered were given in the programme for next session, which also contained the dates of the different examinations, and the names of the examiners. This information was reproduced in the "JOURNAL" for Oct. 14 last [p. 77]; but for the benefit of those who did not at the time make a note of it, and have not now by them the issue of the "JOURNAL" referred to, it may be repeated that the programme is published by John Murray, of Albemarle Street, W., at the price of 2s. 6d. net [postage 4d.]. Beyond what has been mentioned, it contains the regulations and all the syllabuses of the subjects in which examinations are held.

As usual, the examiners' reports draw attention to matters to which candidates would do well to give heed. They show that there is still need for considerable improvement in the general education of students in technical schools. In many different subjects, the examiners call attention to such matters as the inability of candidates to express themselves clearly when writing answers; their weakness in dealing with questions involving even quite simple arithmetic; and the frequency with which questions that call for sketches are avoided, or the sketches if attempted are poor. Frequently questions are read carelessly, and as a result candidates either do not answer the question set or waste their time by including in their answers irrelevant matter that is not required and does nothing to elucidate or amplify the answer given. In the preceding report, it was remarked that the standard of candidates in the chemical subjects was low; but the Committee are glad now to note an improvement in certain directions—including Gas Engineering. They add, however, that in Coal Tar Distillation and in the Manufacture of Intermediate Products for dyes, a considerably higher standard should be aimed at. An appeal is made to manufacturers and employers to give technical colleges and schools in still greater measure the cordial support they so well deserve.

There are in the report tables showing the general results of the examinations, and details of passes and failures. In Gas Engineering, the percentage of failures was only 4·9 (6 out of 121 candidates); while in Gas Supply it was 48·4 (32 out of 66).

FLAT-FLAME LIGHTING.

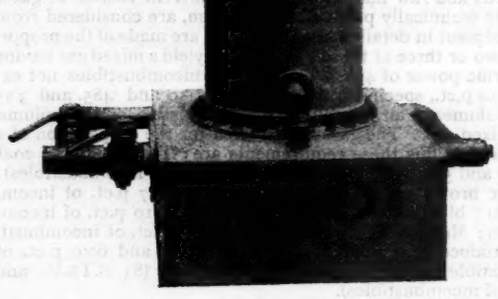
[Communicated.]

THE reduction in the illuminating power of town gas as generally supplied, while not affecting the value and utility of gas for the majority of purposes, undoubtedly does leave a certain section of consumers in the lurch who have no alternative to flat-flame lighting for certain processes in manufacture.

In large industrial centres there are many factories and establishments where the old-fashioned naked flame burner still persists, and is likely to do so from sheer necessity. In stamp shops and many machine shops, a light close to the work is required; and the excessive vibration is quickly fatal to any form of incandescent mantle. Electric light is also out of the question. The working conditions in such places are often very rough; and mantles or electric lamps would stand a very small chance of reasonable length of life from the manner in which they are handled, even if satisfactory adaptation to the particular conditions were possible.

Flat-flame burners with the present gas give unsatisfactory results—the lighting effect is bad, work is hindered, and even danger to operatives may ensue. In an effort to get a better light, it is a common sight to see burners knocked out of the sockets by workmen, and gas is flared away from the open pipe at a ruinously wasteful rate, without in any way improving the result, and certainly with detriment to the frequently already oppressive state of the atmosphere. The obvious remedy for this state of affairs is to effect local improvement in the illuminating value of the gas supplied to the burners in the shops where it is required. To achieve this result, some form of carburetter is necessary to add to the gas hydrocarbons which it stands in need of for this particular purpose.

A considerable amount of experimental work in this connection has been carried out to arrive at a satisfactory appliance for the purpose. The apparatus, while being perfectly safe and automatic in its action, is entirely free from any form of wick or screen, which sooner or later is bound to become foul and act as an obstruction to the free passage of gas. The device illustrated herewith satisfactorily carries out these requirements. National benzol is recommended for use with it.

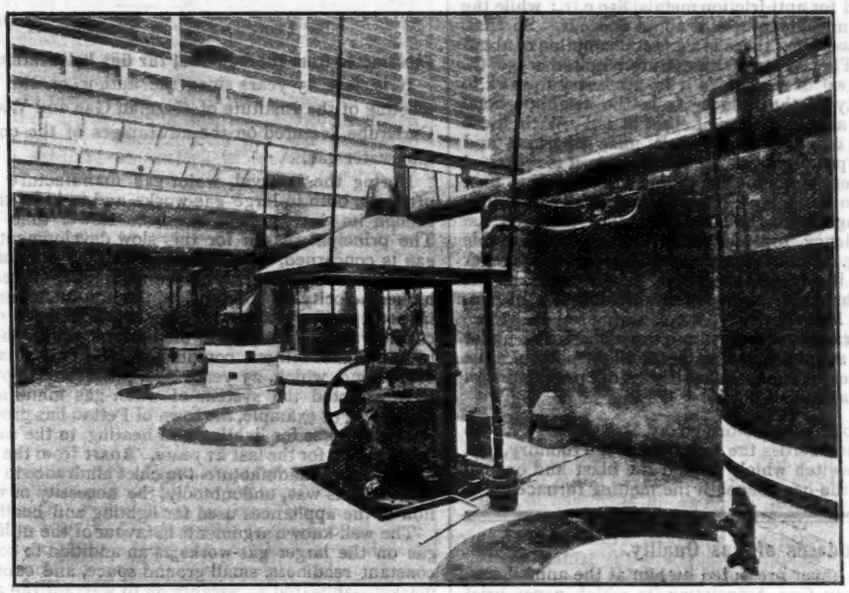


The apparatus is intended to be fixed on the pipe line supplying the lights to be dealt with, either directly on the meter outlet, or, in the case of large factories, on individual pipe lines as may be required. A bye-pass may be fitted as shown, to control the degree of carburation. The container (the capacity of which is 2 gallons) is filled with benzol, the cap firmly replaced, and the tap connecting the upper and lower tanks turned on. The feed from the container to the carburetting chamber is automatic. The apparatus, which will deal with up to 300 c.ft. per hour, is entirely enclosed; and there is no possibility of leakage of benzol or vapour.

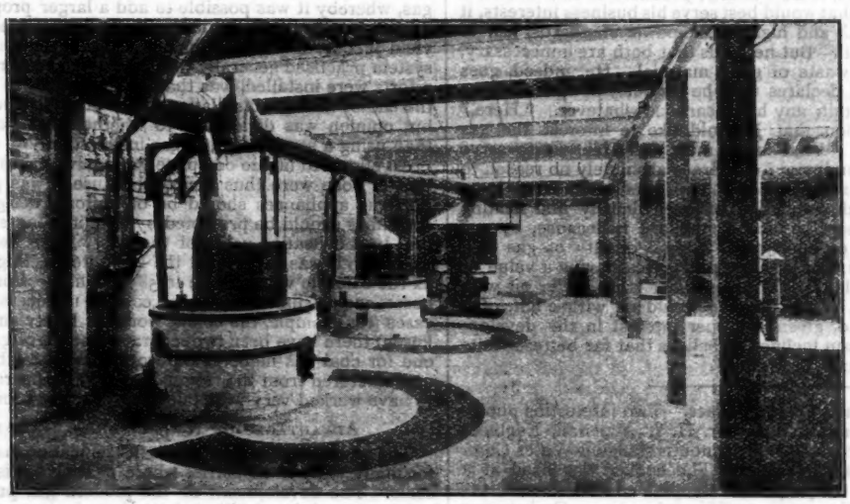
The luminosity of the gas passed through the apparatus is naturally very greatly increased, rendering it perfectly satisfactory for use in flat-flame burners. The resultant economy in gas consumption in the cases referred to easily compensates for the cost of benzol used. The consumption of benzol will vary according to the degree of luminosity required. As a guide, it may be stated that 0·3 gallon per 1000 c.ft. will raise the illuminating power on a No. 2 argand burner from 5 to 16·5 candles.

The apparatus is being handled by Messrs. William Beal & Co., of No. 2, Hill Street, Birmingham.

GAS-FURNACES IN A LONDON METAL FOUNDRY.



There was a large gathering last Thursday afternoon, in Holland Street, on the south side of Blackfriars Bridge, to inspect an up-to-date and excellently arranged new London works belonging Fry's Metal Foundry. The firm (who also have foundries in Manchester, Bristol, and Dublin) originated in 1912, and started business in Holland Street, S.E.—on the opposite side of which the new premises have been erected. The operations carried on by the firm mainly consist in the manufacture of all alloys of tin, antimony, lead, and copper, including the "Fryotype" printing metals, which constitute the main part of the work. The works are divided into three separate departments—(*a*) the manufacture of the best alloys; (*b*) castings of all kinds; and (*c*) the refining of dross and ashes, the metal recovered from which is reserved for inferior alloys and castings. During the war, the firm were mainly engaged in the output of shrapnel bullet metal, of which they made something approaching 20,000 tons in all. They were also supplying bearing metals for aeroplanes, submarine tanks, &c. The metal when taken from the ingot moulds is immediately placed on stands, which are raised from the floor by a mechanical elevating truck, and moved about as required without further handling. While the metal is in the pot, its temperature is controlled by means of a pyrometer, and thus overheating—one of the great enemies of the metal mixer—is avoided. The constituents of most printing metals are tin, antimony, and lead; and from suitable combinations of these three, together with copper, various grades of anti-friction metal are also produced. Fry's Metal Foundry mixes all metals in the molten state, which are vigorously stirred the whole time to ensure complete homogeneity.



This, however, is general. What is of particular interest to "JOURNAL" readers is the fact that the whole of the operations on the works are carried out by gas. As the result of the firm's experience at the old foundry with gas-firing during the past three years, they came to the conclusion that their new works should be entirely equipped with gas-fired furnaces. They used then as fuels both coke and gas; and the determination to employ gas solely in the new foundry was arrived at after comparing costs, and taking all other factors into consideration. From the purely monetary point of view, they found that (even at the present price of gas) it would pay them to use it. Then there is the great cleanliness secured, in comparison with the trouble hitherto experienced with coke ashes. Another point is the ease of control. When the metal has been raised to the desired temperature, the gas can be at once shut off, without the trouble of drawing fires, and so on. The employees, too, declare that the conditions of labour are infinitely superior to what they were in the old days and that they would not care to go back to coke-firing.

Quite an array of gas-furnaces has been installed, all specially designed by the South Metropolitan Gas Company, and some of them are shown in the accompanying photographs. The equipment includes a 7-ton capacity furnace, six 2-ton furnaces for printers' metals, a 600-lb. crucible tilting furnace, and quite a number of smaller furnaces for experimental work. All of them are off a low-pressure gas supply (25-10ths), with air supply at a pressure of ½ lb. per sq. in. The system (of which several installations have been put into different works) embodies a special method of burning the gas in two stages; the object being the prevention of the destruction of the pot by an intensely hot local flame. To each furnace there is a gas supply, a mixture supply,

and a secondary air supply. This plan renders the working very silent; and there is a more even distribution of the heat.

As to gas consumption, each of the 2-ton furnaces requires 500 c.ft. of gas per hour, the 7-ton furnace 700 c.ft., and the tilting furnace (which is used for anti-friction metals) 850 c.ft.; while the smaller furnaces account altogether for about 600 c.ft. So that, with all the furnaces working, there is a gas consumption of about 5000 c.ft. per hour. The average temperature required is 550° C., although for one or two of the alloys it is necessary to work to 650° C. The capacity of the foundry is in the neighbourhood of 36 tons of metal in a working day of eight hours. With these gas-furnaces, the men can quite easily melt, mix, superheat and pour two batches per pot per day. In other words, it is reckoned that with gas firing there is double the output of coke firing in a given time for a given capacity. All pots are bottom pouring; and, indeed, everything appears to have been done to reach the highest point of efficiency, together with the most comfortable conditions of working. In conversation with the works manager (Mr. Leslie Sarjeant), it was gathered that, as the result of the firm's experience in this new foundry, they are thinking of converting their works at Manchester from coke-firing to gas.

Gas is also used in radiators for heating the offices, and under a Potterton boiler for supplying hot water for all purposes; while there is also a completely fitted chemical laboratory provided with a number of gas appliances.

The opening ceremony was performed by Mrs. John Fry, who severed a cord stretched across the entrance to the foundry, and operated the electric switch which started the blast and opened the valves controlling the heat beneath the melting furnaces.

Standards of Gas Quality.

In the course of the paper presented by him at the annual convention of the American Gas Association [to which paper brief reference was made in last week's issue of the "JOURNAL," p. 725], Mr. Henry L. Doherty remarked that, provided gas people can be stimulated to active work on rational lines, he regards with great optimism the future of the industry. That is to say, this feeling depends entirely upon the people of the gas business realizing the changes that have taken place in our lives and methods since the time of Murdoch. The future depends upon substituting gas for solid fuel; and men are needed with the vision of prophets, rather than men who simply know the history of the gas business. The present standards are absurd, unnecessary, and a relic of a bygone day. It is to be doubted if any gas company to-day sells more than 4 p.ct. of its gas for use in open-flame burners; and it is ridiculous to enrich gas with hydrocarbons at great expense, so that 40 c.ft. out of every 1000 c.ft. can be consumed in the most wasteful way to produce light. The public themselves would be benefited if they were served with a non-luminous gas; for this would force an economical method of using the gas on the part of the unthrifty. Mr. Doherty, after having been a producer of gas for a great many years, is now a large producer of oil; and so, if he were to advocate what would best serve his business interests, it would be high B.Th.U. and high candle-power standards, just to ensure a market for oil. But he holds that both are unnecessary, and are generally a waste of good material. He, indeed, goes further than this, and declares that he seriously doubts whether the ideal gas will contain any hydrocarbons whatever. "Here," he said, "is a question that I would like to interest the gas fraternity in solving. What is the most desirable gas to serve from a customer's standpoint? There is absolutely no reason to fix on a gas of approximately 600 B.Th.U. per c.ft. There is no elemental gas of such a relation between density and heating value. The only reason for such a standard is because, by our present methods of carbonization, a good quality of gas coal tends to produce a mixture of elemental gases having a value of approximately 600 B.Th.U. The consumer is no better off with 1 c.ft. of a 600 B.Th.U. gas than he would be with 2 c.ft. of a 300 B.Th.U. gas; and, given a proper interest in the development of appliances, I am inclined to believe that far better results would be got from 300 B.Th.U. gas."

Cooker-Top as a Rat's Hoarding Place.—Two interesting photographs have been forwarded by Mr. H. W. Woodall, Engineer and General Manager of the Bournemouth Gas and Water Company, of the top of a gas-cooker. The cooker was fixed at a boarding-house; and the proprietor complained that when it was lighted a noxious smell was given off from the stove. On bringing the cooker in and removing the top, the cavity was found to be filled with bones. It was impossible for anybody to have put the bones into the place where they were found; and the assumption is that the space was used as a hoarding-place by a rat.

Electrical Precipitation of Tar-Fog.—According to a communication to the Canadian Mining Institute, the Cottrell process of electric precipitation of tar-fog is quite able to deal with the crude gases produced in the distillation of coal, wood, and petroleum, even at the high temperatures used in modern industrial processes; while the usual methods of tar removal in extractors require cooling of the gases. The author of the communication referred to stated that he obtained cleaner distillates with electrical precipitation than formerly. The chamber he used consisted of an iron pipe, 75 ft. high and 12 in. diameter, provided with fused quartz insulators. The heater requires 2 to 3 H.P.

NON-RESIDUAL GASIFICATION.

A PAPER WRITTEN IN COMMEMORATION OF THE SEVENTIETH BIRTHDAY OF PROF. DR. H. BUNTE.

By Prof. Dr. HUGO STRACHE, of Vienna.

[Abstracted from the "Journal für Gas Beleuchtung," Nov. 29, 1919.]

It is just 25 years since the author, on the occasion of the meeting of the Institute of German Gas and Water Engineers at Carlsruhe, lectured on the advantages of the conversion of coke into water gas.

During the interval, water-gas manufacture has made great progress, both in large gas-works and in independent industries, though its development has been slower than was anticipated. The principal reason for this slow development, so far as town gas is concerned, is to be assigned to the peculiar characteristics of water gas—lower calorific value, smaller air requirement, much higher velocity of combustion, the non-luminous blue flame, and higher specific gravity. These characteristics render necessary considerable alterations in the burners, which one would not care to undertake without compulsion. Several small towns, on the other hand, which, 25 years ago, possessed no public gas supply, have adopted the system of water-gas manufacture, pure and simple. For example, the town of Pettau has provided a supply of pure water gas for lighting and heating, to the satisfaction of the inhabitants, for the last 21 years. Apart from the purely practical difficulties of manufacture, the chief hindrance to the introduction of water gas was, undoubtedly, the necessity of wholesale alteration of the appliances used for lighting and heating.

The well-known arguments in favour of the utilization of water-gas on the larger gas-works as an addition to coal gas—such as constant readiness, small ground space, and control of the coke market—appeared so weighty as to warrant the anticipation that this means of gas manufacture would be largely adopted. But unfortunately the general understanding among gas engineers, that a town gas of about 560 B.Th.U. gross was necessary, militated against the employment of simple water gas. Carburetting, it is true, afforded a ready means of enrichment. But, on the one hand, the properties of gases are not determined simply by their heating value, and therefore the consumer suffered considerably from the altered composition of the gas, and the changes in the supply brought about by the varying degrees of carburetting; and, on the other hand, the cost of oil was so high as to make it imperative for the gas manager to manufacture as large a proportion of coal gas as possible, and use the carburetted water-gas plant merely for peak-loads. Only a few gas-works—notably Königsberg and Elberfeld—were bold enough to make a practice of adding straight water gas to their coal gas, thereby maintaining a constant quality of a cheaper mixture. The consumer was better satisfied with this gas than with the carburetted mixture.

Nuremberg, for example, found it profitable to make a rich coal gas, whereby it was possible to add a larger proportion of water gas, and realize the additional advantages of fuel saving, a larger yield of coke, and a reduction in the cost of retort maintenance. A system practised generally throughout the country, where vertical retorts were installed, was that of steaming the charges towards the end of the coal distillation. This also produced a mixed gas; but opinion was divided as to whether this method was better than using a separate water-gas installation.

All efforts to utilize completely the advantages of the gasification of coke were thus limited, because it was generally agreed that gas appliances should be of uniform design, and that the consumer should be protected by a limit being set to the reduction in the heating value of the gas. As is well known, in the year 1909 it was decided, at the Institute meeting in Frankfurt, to fix the calorific value at 562 to 585 B.Th.U. For industrial purposes, such a limitation is, of course, unnecessary. In certain cases (for example, the colour works of Bayer and Co., at Leverkusen) there have been two separate systems of gas distribution—one for coal gas made in the works, and the other for water-gas manufactured from the residual coke. This arrangement is said to have worked very well, but has so far not been copied.

ADVANTAGES OF NON-RESIDUAL GASIFICATION.

The advantages of non-residual gasification have been utilized for many years in industries where heating gas is used on a large scale. The development of the modern gas producer with revolving hearth has facilitated the introduction of gaseous firing. Gas-firing was much to be preferred, especially where high temperatures were required, as these are more easily and economically attained than with coal or coke firing, owing to the possibility of working with a much smaller excess of air.

Unfortunately, in most cases the bye-products—tar, ammonia, and sulphur—were not recovered, but were burnt with the gas. It has always been objected by steel manufacturers and others that, in order to recover the bye-products, it was necessary to cool the gas, and thus lose the sensible heat; and, further, that the absence of the tar particles reduced the calorific value of the gas so much that the desired results were rendered unattainable. Besides, the apparatus required for the recovery of the bye-products was thought to be too complicated. In the case of boiler firing with gas, although there is a better efficiency owing to the smaller excess of air required, the advantage is not so great as it

is with steel-melting furnaces, glass pots, &c., where the temperatures are so much higher.

The war has worked a wonderful change in these conditions. At first, there arose in the German Empire a great demand for oil fuel, especially at the time when the Galician oil-fields were occupied by the enemy. The development of motor transport and of aircraft increased this demand, with which was coupled the need of lubricating oils. The Kaiser Wilhelm Institute for Coal Research, at Mulheim a.d. Ruhr, has placed the country under a great debt by discovering that primary coal tar could supply to a large extent all the requirements. Again, ammonia, formerly almost exclusively obtained from gas and coke-oven works, was perforce oxidized to nitric acid for the making of explosives.

Agriculture thus lost its most important fertilizer; and the urgency of the demand for ammonia would have been inconceivable had it not been for the great success of the Frank and Caro calcium cyanamide synthesis on the one hand, and the Haber ammonia synthesis on the other. As it was, the proposition of recovering nitrogen in the form of ammonia from coke and brown coal by means of gas-producers working with excess of steam was a very attractive one. It cannot, of course, be overlooked that the large works which have already been erected for the purpose of synthetizing nitrogen compounds will have a powerful influence on the price of ammonia; but, in spite of this, the recovery of ammonia as a bye-product is bound to retain its great importance.

The position as regards tar is that, when it is made under proper working conditions—that is, so arranged that the gases passing through the coal have no higher temperature than the coal itself—it is of such a character as to give great promise for future industrial uses. We find we are able to get, not only fuel oils, lubricating oils, paraffin, and creosote, but also, by moderate destructive distillation of the primary tar, benzene hydrocarbons and oil gas, which latter will probably have a more important future, owing to the chemical decompositions which it readily undergoes, than was formerly ascribed to it.

Other influences of the great war on these conditions arose out of the reduction in the supply of coal, the poor working of the coal mines, and malnutrition of the workers, with its consequent diminution in output, and even in the desire to work. Besides this, we have the dearth of coal due to the enormous deliveries to the entente under the peace terms. It is, therefore, high time that special attention should be given to the subject of complete gasification. We may assume, according to modern practice, that the thermal efficiency of gas making with producers is 70 to 80 p.ct.; while in the process of distillation about 50 p.ct. of the heating value of the coal charged remains in the form of coke, only 45 p.ct. of the remaining 50 p.ct.—that is, 22½ p.ct.—appearing in the form of coal gas. There are, however, special advantages in complete gasification as regards handling of materials.

By the usual methods of coal distillation, a ton of coal (of 12,600 B.Th.U.) produces about 10,800 c.ft., of gas having a calorific value of 630 B.Th.U. gross, and at the same time 10 cwt. of coke (of 12,600 B.Th.U.). Therefore, to produce 10,000 c.ft. of gas, 18·52 cwt. of coal must be supplied and 9·26 cwt. of coke removed. The 10,000 c.ft. of gas have a calorific value of 6,300,000 B.Th.U. For 1,000,000 heat units we shall therefore require the manipulation of approximately 4·4 cwt. of coal and coke. In complete gasification, assuming an efficiency of 70 p.ct., we receive in the form of gas from a ton of coal 19,800,000 B.Th.U., or for 1,000,000 B.Th.U. we require the handling of 1·01 cwt. of fuel—less than a quarter of what is required in distillation.

"Double Gas" and "Trigas."

If we now consider the different methods of residueless gasification, we have, in the first place, the gases containing a large proportion of nitrogen—ordinary producer gas, semi-water gas from coal, Mond gas, &c.; and, secondly, the gases containing a much smaller proportion of nitrogen and possessing a higher heating value—"Double gas" and "Trigas" ["Doppel gas," "Trigas"]. The gases of the first group have a nitrogen content of 50 p.ct. or over, and a heating value of 130 to 170 B.Th.U. "Double gas" contains 3 to 6 p.ct. of nitrogen, and has a calorific value of 360 to 390 B.Th.U.; while "Trigas" (which, as indicated by its name and the patent specification, consists of three gases, coal gas, water gas, and producer gas) must possess a higher nitrogen content and a lower calorific value than "Double gas."

It is quite certain that all kinds of gas which can be obtained by complete gasification have lower heating value than the coal gas or mixed town gas distributed before the war. The sudden transition to complete gasification would have led to the entire alteration of gas burners and appliances, had not the dearth of coal, and the unsuitability of that supplied during the war, already compelled gas-works in general to drop their standard of heating value lower and lower, even in some cases as far as 450 B.Th.U. This reduction in quality was not always brought about by the addition of water gas. It was often done by the introduction of furnace gases high in carbon dioxide and nitrogen; and this had a much more unfavourable influence on the properties of the gas than the addition of water gas.

The direct transition from a gas of 560 B.Th.U. to one of 450 B.Th.U., or even 360 B.Th.U., ought naturally to be followed by a reduction in price per 1000 c.ft. Instead of this, however, the war has taught the gas consumer to count on a rising price as well as a falling value; and he has had to bow to the inevitable. We look to the near future for a reduction in price, and a price fixed, not on the number of cubic feet, but on the number of heat units supplied.

It may be said that gas will never be so cheap again, whether we go back to pure distillation or not. But it can be stated with assurance that heat units in the gaseous form can be supplied more cheaply by residueless gasification than by distillation. If one comes to consider the addition of water gas to coal gas, one has to admit that, from the point of view of illumination, the mixed gas has a superiority; for, though the heating value per cubic foot is reduced, the flame-temperature, as well as the candle power per B.Th.U. is increased. The question as to whether the use of such a gas for technical purposes would be interfered with by the diminution in heating value, is not difficult to answer. The increase in flame-temperature attained by the higher velocity of combustion will undoubtedly have a favourable effect in most cases, and compensate for the reduction in calorific value.

The anxiety which one formerly felt regarding the regulation of the burners, is swamped by the much greater anxieties of gas supply which the war has brought in its trail. The main thing is to supply a gas of constant composition. Undertakings which have continuously added straight water gas to their coal gas have experienced no difficulty in this respect.

Gases Containing a Large Proportion of Nitrogen.

We have spoken of the distribution of gas of low nitrogen content, and must now say a word about gas containing a large proportion of this inert material. About twenty years ago, a large centralized Mond gas installation was erected in England for the purpose of supplying an extensive industrial area with gaseous fuel. For a number of years the investment provided no dividend for the shareholders; and this fact has often been quoted as a warning against the erection of similar producer-gas stations. But of late years the undertaking referred to has been a paying concern; and it must be pointed out that to-day circumstances favour its success much more than they did when the plant was built, if only on account of the much higher prices realized by the bye-products.

Even to-day, however, the supply to far-distant places of producer gas of high nitrogen content and low calorific value cannot be recommended, on account of the prohibitive cost of distribution. Large fuel-gas stations already exist, and fully justify their existence, where there are no great distances to be overcome—especially in steel and similar industries where the gaseous fuel is obtained by a process of complete gasification. That these installations will be more profitable if the bye-products are recovered, seems to me certain, as any diminution in heating effect, such as has been experienced in Siemens-Martin furnaces by the removal of tar from the gas, can be readily made good by adding richer gas low in nitrogen—such as "Double gas" or "Trigas."

In this way, the production of tar and ammonia (both of which are so essential to the prosperity of our country, which unfortunately possesses only very small supplies of mineral oil) would be very materially increased. It is admittedly a difficult matter to determine in some cases of complete gasification whether or not it is profitable to recover the bye-products. This was one of the most important reasons for the recent founding of the Vienna Institute for Coal Gasification and Bye-Product Recovery. A large number of industries have already reaped great benefit from the researches undertaken and the conclusions so far arrived at by the Institute.

The modern practice of large installations for converting coal into mechanical energy is to make use of boilers and steam-turbines. It is only rarely that the energy is directly obtained from gas. This is due to the unfortunate fact that the present types of gas-engines are restricted to a size of 4000 to 6000 H.P. It is still to be hoped that engineers will be able to construct successfully larger units, when future occasion demands.

Whether the gas-turbine, which has already made a good beginning, will be helpful in this direction, remains to be seen. In any case, in making comparisons between direct coal firing and gaseous firing, one must always keep in mind the possibility of recovering the bye-products of the coal at the same time as converting the heat energy of the gas directly into mechanical energy. The objections raised to the use of large engines, on account of their comparative complexity, inconvenience, and lack of adaptability, make their introduction a matter of difficulty; but these drawbacks ought to be overlooked in face of the saving of coal.

The Diesel Engine.

To complete the subject of the production of mechanical energy from coal, we must also give consideration to the Diesel engine. The oils which form the chief constituent of low-temperature tar are excellent for oil-engines; and these, as is well known, have a thermal efficiency much higher than that of the steam-turbine. As these oils can be obtained in large quantity (5 to 10 p.ct.), from brown coal and other cheap fuels, there can be no doubt it is more economical of raw fuel to adopt the gas firing of boilers for raising steam to run steam turbines than to use direct firing. It ought also to be borne in mind (this is generally overlooked) that the ammonia recoverable in the processes of complete gasification represents an important quantity of energy; for the ammonia which is not recovered from the nitrogen already present in the coal must be obtained in the form of calcium cyanamide, or by the synthetic Haber process, and the energy which is used

up in these synthetic processes must be credited to the process of complete gasification with bye-product recovery.

The development of the complete gasification of solid fuel has occupied the last few decades; and its complete development will occupy a good many years more. That the process had not got a footing sooner was due largely to the resistance which the introduction of new methods invariably meets, until the clear recognition of the advantages to be gained overcomes the inconveniences of the troublesome and often difficult alterations that are rendered necessary. To this must be added the resistance of invested capital, which always seeks to preserve existing processes as long as possible. All these obstacles must be swept away by recognizing the present compelling necessity of using our natural resources to the fullest possible advantage.

TEMPERATURE EFFECTS IN COKE-OVENS.

Some carbonizing variations affected by temperature changes in the top of the coking chamber at the Langley Park coke-works of the Consett Iron Company, Ltd., were described by Mr. A. H. MIDDLETON in a paper which he read at Durham, before the Northern Section of the Coke-Oven Managers' Association.

He said that though the desirability of low top-heats in the coking chamber is appreciated by coke-oven builders, coke-oven managers, and carbonizing engineers generally, it is a subject upon which very little exact information exists, and into which little careful investigation has been made. The temperatures which prevail in the tops of the ovens are rarely measured, and the conditions which govern the temperature, and the effects of such temperature, are seldom considered as fully as they should be. During his investigation into the cause of a very unusual experience at the Langley Park coke-works he collected some information that might be helpful to members of the Association and others who had to consider carbonizing problems.

The experience referred to was the presence of large quantities of paraffin hydrocarbons in the crude benzol and the rectified products made therefrom which was experienced at Langley Park some time ago. There is nothing unusual in getting liquid hydrocarbons of the paraffin series from the distillation of coal, as they are among the usual products of low-temperature carbonization; but it is quite exceptional to produce them in ordinary bye-product coke-oven practice. The cause was the unusually low temperature at which some of the products of carbonization were enabled to escape from the oven, owing to a special feature in the construction of the oven, and to the fact that the ovens were very fully loaded, so that the space between the top of the coke and the crown of the oven was very small, making the gas travel quickly through this empty space.

The special feature in the construction of the oven referred to is the exceptionally great distance between the top of the heating flues and the crown of the oven-arch, which distance he had kept to a maximum when the ovens were built, so as to obtain low top-heats, particularly with a view to preventing the splitting-up of ammonia. That it should be also responsible for obtaining some of the products of low-temperature carbonization, was an unlooked-for result.

As he could not, after careful investigation, attribute the paraffins to any external cause, he concluded that they must have been formed inside the oven; and he decided that the best way to put this conclusion to the test was to raise the temperature of the top of the oven, so that if low-temperature products were present they would be split-up by the radiant heat from the oven roof. The quickest and most effective way to raise the temperature of the top of the oven for this purpose was to reduce the amount of coal charged into the oven. The load was therefore reduced some 16 in.; and the result was most marked. The paraffins immediately began to disappear as the gas from the lightly-loaded ovens came under treatment; and by the time all the ovens had been charged with light loads the paraffin content of the benzol was reduced from 9 to 1·5 p.ct.

This result was very interesting and satisfactory so far as it went; but they were not prepared to reduce the loads of the ovens in this way, so set about finding some other solution. He argued that, as they had got rid of the paraffins by subjecting the gas to a high temperature in the oven roof, the presence of these paraffin bodies when the ovens were heavily charged was due to the fact that some of the gas, as it was given off from the coal, had escaped from the oven without being subjected to a sufficient temperature to break-up all the primary products of distillation, and that the preservation of these low-temperature products was due to the fact that the gas had travelled up the comparatively cool core of coal in the centre of the charge, and so escaped splitting-up, as the temperature in the roof of the oven was very low when the ovens were fully loaded. He further argued that, if the gas could be prevented from travelling-up the cool core of coal in the centre of the charge, and be forced to travel through the hot coke, they could get rid of the paraffins without reducing the loads in the oven, and so raising the temperature in the roof of the oven, and causing the splitting-up in the hot empty space. They had up to then been charging with uncrushed small coal. By charging ovens with finely crushed coal instead of with uncrushed small, the output of the ovens is reduced to an extent which is not generally realized. The improved coke obtained from the finely crushed coal in many cases, however, justifies the large loss of output per oven.

Returning to the travel of the gas in the oven, Mr. Middleton said that, if the passage for the gas up the core of coal in the centre of the charge is due to the presence of a certain amount of larger coal with the very fine coal, thus ensuring air spaces through which the gas can travel, he came to the conclusion that, if all the coal was crushed, the air pockets would be filled-up, and the cool central passage for the gas might be blocked-up. The gas would then be forced to travel out through the hot coke; and the low-temperature products of distillation would be split-up, and the paraffins consequently disappear from the benzol. All the ovens were therefore filled to the top with finely crushed coal, with the result that the paraffins in the benzol again disappeared. They had therefore satisfactorily solved the problem of the presence of the paraffins in the benzol, and apparently thrown some light on the important question of the passage taken by the gas on its way from the ovens.

Unfortunately for the investigator into carbonizing problems, the phenomena under observation are not the results of only one or two conditions; but they are due to the balance of a number of influences—some acting in one way, and some in another, some under control and observation, others unknown—with the result that it is sometimes most difficult to draw definite conclusions from investigations and observations. For instance, in getting rid of the paraffins in the benzol by putting lighter charges into the ovens, they did not merely alter one condition—*i.e.*, the weight of coal put into the oven—but, as a result of the smaller charge, sent up the temperature of the top of the oven. This was a change which it was wished to produce; but in bringing it about, they altered another condition of carbonization—*i.e.*, ceased to carbonize any coal in the top portion of the oven. It may very well be that the whole of the paraffins in the benzol were derived from the coal that had previously been carbonized in this portion of the oven; for when the oven is well filled, the coal in this portion is probably carbonized at a lower temperature than the rest of the coal in the other portion of the oven, as there is no heating-flue opposite the top portion.

Similarly, there is an alternative explanation for the disappearance of the paraffins in the benzol in the second method successfully tried—*i.e.*, that their disappearance was not due to an alteration in the passage of the gas in the ovens, but to the fact that in changing from uncrushed small coal to crushed small they had not provided another passage for the gas as surmised, but had altered another of the conditions—namely, the temperature at which carbonization took place. Because it is a fact that the change from uncrushed small to crushed small, resulted in a reduction of the charge carbonized by over 8 p.ct.; and it is quite possible that the gas for heating the ovens was not reduced in the same proportion, and thereby raised the temperature of carbonization, which would, in itself, account for the disappearance of the paraffins. Experiments since made tend to show that this alternative explanation is the correct one.

Of the phenomena noticed when producing benzol which contained paraffins, one of the most important was the decreased yield of crude benzol per ton of coal. This yield varied inversely with the weight of the charge put into the oven. This is due to the fact that, when the ovens were loaded very heavily, the tops of the ovens were considerably colder than when they were loaded less heavily, with the result that they were getting in the one case some low-temperature products and low benzol yields, and in the other case the low-temperature products were decomposed and high benzol yields resulted. What probably takes place is that, when the conditions in the oven are favourable to the preservation of the products of low-temperature carbonization, a series of bodies metameric with the ethylene series called naphthenes are formed. Little is known about them; but they are found in considerable quantities in low-temperature tar. When these bodies are decomposed by heat, they lose hydrogen, and are converted into benzene, toluene, xylene, &c. An examination of the gas tends to confirm this explanation.

Another important result of these changes in conditions of carbonization has to be noted, that is the effect on the yield of ammonia. When benzol yields were lowest, the ammonia yields were highest. This is just what might be expected after considering the conditions under which the paraffinoid benzol was formed, as these conditions—namely, quick passage from the ovens and low top-heat—are generally recognized as the ideal to be aimed at for high ammonia yields. The difference between the ammonia yields under the two conditions was from 1½ to 2 lbs. per ton of coal carbonized.

It is important to note that the best ammonia yields cannot be obtained under the conditions necessary to obtain the highest yield of benzol. This, at any rate, is true for dry coal. It may be that with wet coal the steam might exert a protecting influence over the ammonia, while not preventing the splitting-up of the naphthenes into benzene, &c.

There were several other interesting phenomena connected with these conditions of carbonization. One of them is the influence on the production of naphthalene. The yield of naphthalene when paraffinoid benzols were obtained was very much reduced. As naphthalene is a product of high temperature, one would naturally expect this result. The naphthalene was replaced by a much more welcome member of its series, in the form of a light oil which made an excellent wash-oil for use on the scrubbers for benzol recovery. It has some of the characteristics of low-

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INVERNESS	"		40
BERGEN	NORWAY	2nd Installation	57
STOCKPORT	ENGLAND		168
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temperature oils and is not an oil usually recovered from coke-oven tars.

Another effect of these conditions of carbonization is the influence on the composition of the crude benzol. Below is the percentage of rectified products from the crude benzol during both normal and abnormal conditions of carbonization:

Percentage Yield from Crude Benzol Rectified.

		Motor Spirit Containing all Benzol and all Toluol.	Solvent Naphtha 90 p.ct. at 160° C.
High-temperature carbonization		66·05 p.ct.	3·47
	Benzol 95 p.ct. at 90° C.	Toluol 90 p.ct. in 0·8 at 110° C.	Solvt. Naphtha 90 p.ct. at 160° C.
Low-temperature carbonization	46·09 p.ct.	10·79 p.ct.	10·37

The yield of solvent naphtha, which, in this case, is really a mixture of what is usually known as solvent naphtha and paraffins distilling at the same temperature, is noticeably high.

During his investigations into the phenomena considered, all the old speculations as to the course taken by the newly-distilled gas on its way from the oven were frequently in Mr. Middleton's mind. So, in order to get some further information as to what had been occurring in the ovens, he had a series of complete gas analyses and oven-top temperatures taken over the whole of the carbonization period under different conditions of load—*i.e.*, light and heavy charges—and under different conditions of carbonization, by varying the temperature in the heating walls, and also with coals of different sizes (crushed small, and a mixture of peas and nuts). The information obtained from these experiments, considered in conjunction with the results of some experiments made by the late Prof. Vivian B. Lewes, and set out in his book on the "Carbonization of Coal" [pp. 162 and 163], helps, Mr. Middleton thinks, to establish the opinion held by many, but not by all, that the primary products of distillation on their way out of the oven travel-up the comparatively cool core of coal in the centre of the oven, and escape into the top of the oven without being subject to such temperatures as would cause their decomposition.

This argument will be more readily followed by bearing in mind that the gas, as it reaches the ascension-pipes, is, during practically the whole period of carbonization, a mixture of:

(1) The primary products of distillation from the coal given off up to 500° C.

(2) The secondary products derived from the high-temperature distillation of the tar and the soft coke at a temperature between 500° C. and the maximum temperature to which the coke is heated in the oven—*i.e.*, 1000° to 1100° C.

The proportions of (1) and (2) in the mixture vary at different periods of carbonization; but the total is roughly half-and-half of each.

As to the special feature in the construction of the ovens at Langley Park—the large "flueless space" between the crown of the oven arch and the top of the heating flues in the oven walls—this is largely responsible for the unusual conditions dealt with in the paper. As, proceeded Mr. Middleton, it is such an important point in coke-oven design, and one on which no data so far as I am aware have been published, I will refer to it in a little more detail.

I think from what I have said you will have realized the importance of having this space as great as possible; and it is quite clear that we have in the ovens under consideration reached the limit beyond which it is not advisable to go. In fact, I think we have found the correct dimension for this part of the oven; for, as I have shown, we can so work the plant as to get a top-heat so low that we get low-temperature distillation products, or we can, by raising the gas pressure in the heating flues, get a sufficiently high temperature, even when the ovens are loaded to their fullest capacity, to break-up these low-temperature distillation products. I wish here to make it quite clear that the coke made in the top portion of the oven opposite the "flueless space" is of the same good quality as the coke made in the rest of the oven.

Fourteen or so years ago, many ovens were built in which this "flueless space" dimension was as low as 7½ in. and 9 in. This was the length adopted by all the coke-oven construction companies who were building coke-ovens in Durham at that time, and even later. No wonder there was a lot of trouble with retort carbon on the roof of the ovens. Most of the firms have in their later designs considerably increased the space, though some of them have still to make further increases in this direction before their design is correct.

The temperature in a great many of the ovens where this "flueless space" is low must, towards the end of the carbonization period, be hundreds of degrees higher than it should be. I have looked into many of the ovens when they have been taken off the main, and am sure that I have seen heats as high as 1200° C. The splitting-up of ammonia and the general break-up of the gases in such cases is very great, even when the ovens are filled to their fullest capacity. If the ovens are not thoroughly filled, which is often the case, the position is much worse.

Before concluding, I will just call attention to one other point—*i.e.*, the unrivalled excellence of the gas which can so easily be obtained from the ordinary bye-prpduct coke-oven, if proper attention is paid to the working, and especially to the design, so as to secure low top-heats. The best gas-works practice, even with continuous vertical retorts, cannot compete with such a coke-oven as regards quality of gas and cost of production.

FULL CHARGE OF CRUSHED COAL.

Weight of Coke Obtained—6 *Tons* 17 *Cwt.*
Hours Carbonizing—29 *Hrs.* 55 *Mins.*

Hours Burning.	Temperature. °C.	CO_2.	C_nH_{2n}.	O_2.	CO.	H_2.	CH_4.	N_2.	B.Th.U. Gross.
0	610	1·2	6·2	0·4	4·8	33·3	41·9	12·2	692·8
3	620	1·6	4·0	0·2	3·6	43·4	43·4	3·8	683·1
6	620	2·2	3·4	0·2	4·0	51·3	36·6	2·3	626·9
9	630	1·6	3·6	*Nil*	4·0	54·8	35·3	0·7	630·0
12	650	1·5	3·3	0·2	4·0	56·6	33·3	1·1	608·4
15	670	1·8	3·0	*Nil*	3·9	58·0	33·1	0·2	603·2
18	690	1·7	2·9	0·1	4·2	57·3	33·5	0·3	603·6
21	740	1·2	2·6	0·2	4·2	61·2	30·4	0·2	587·8
24	760	0·9	1·3	*Nil*	4·2	64·1	25·0	4·5	511·4
25·5	..	1·0	0·2	*Nil*	5·0	70·8	18·7	4·3	433·7
27	790	0·6	0·4	*Nil*	4·8	82·1	12·1	*Nil*	410·0
28·3	790	0·6	0·2	*Nil*	5·8	83·8	9·3	0·3	383·7

The table will show the general excellence of this gas for public supplies for heating, lighting, or power purposes. Reference to the last column will show that it was not until the end of the eighteenth hour after charging that the calorific value of the gas fell below 600 B.Th.U. gross.

Now that it has been decided for purposes of public supply to sell gas on a more rational basis—*i.e.*, taking the "therm," which is the product of cubic feet × B.Th.U. as the unit—and to limit the percentage of inerts, there will be more inducement to those in charge of gas-works to produce a gas of high calorific value; and the practice of "cracking-up" the hydrocarbons in the gas and in the tar to the fullest extent in order to get the maximum number of cubic feet of gas, irrespective of its true value, will cease to be a commercially sound proposition. Then there is, in my opinion, very little doubt that the bye-product coke-oven will come into general use as the gas-retort of the future.

Coal Said to Come from Petroleum.

In a pamphlet which he has recently issued in the United States, Mr. Robert A. Chesebrough revives a theory as to the origin of coal which he first voiced nearly half-a-century ago. The argument advanced is that water under intense heat in the earth is turned into steam, and the steam is then decomposed; the oxygen being consumed, and the hydrogen set free, and then combining with certain elements in rocks to form natural gas, which he believes to be the parent of all the bitumens and coal measures. This gas, seeking its outlet through seams in the rocks, combines with their soapy carbons, forming thereby the lightest gravity of petroleum, which, becoming liquid, follows the seams or veins in the fissures of the rocks. In the course of ages of time, these light petroleum streams are gradually condensed, becoming heavier in body, such as the crude oils at present found in the Pennsylvania region, and, by still further condensation, the Virginia crude oils. These oils, in certain localities where the surface heat of the earth in past time has been greater form the cannel coals, from which the original kerosene was distilled before the discovery of petroleum. Longer time and greater heat convert the cannel coal into bituminous coal; and, as a final stage, involving still longer time and greater heat, the anthracite coal is evolved, showing the entire evaporation of all its volatile matter. Geology has, he says, never been able to explain why all coal measures lie in veins, rather than great bulky masses, as would have resulted had the vegetable decomposition theory been correct. The production of natural gas is a continuous creation, which is now going on, has always been going on, and will so continue while the life of the earth lasts.

Extensions Needed at Todmorden.—The Todmorden Corporation have been informed by the Manager (Mr. F. V. Barnes) that the demand for gas is getting beyond the producing capacity of the works, and some form of extension will be necessary during the coming summer. The Manager reported the urgent necessity of extension of the carbonizing plant; and a Sub-Committee have been appointed to visit various works, along with him, to inspect modern plant.

Brighouse and "Government Muddling."—Answering questions at a meeting of the Brighouse Town Council last week, the Chairman of the Gas Committee (Mr. J. F. Bottomley) said the department were faced with Government muddling in the form of various recent Orders which contradicted one another. The reduced price of coal was expected to carry a corresponding decrease in the price of domestic gas; but coke, coming under another Order, was constantly advancing in price. The department simply did not know where they were in the matter of prices of coke and other residuals; and he fancied that, before any reduction could be made in the price of gas, there would have to be an increase to meet the advanced cost of freightage and prospective wages increases.

Allegation of Profiteering in Coke.—When a complaint was lodged before the Lambeth Profiteering Committee against the South Metropolitan Gas Company for selling coke at £2 9s. 2d. per ton, Mr. Washington (on the Company's behalf) submitted that coke was controlled, and the Committee had no power to deal with the complaint. Discussion ensued as to the reading of the section of the Profiteering Act dealing with fuel and lighting, and the Fuel and Lighting Order. The Clerk said the point at issue was to what extent coke was controlled. The section under the Profiteering Act included all articles of fuel and lighting except coal; and the natural inference was that coke was included in the Profiteering Act. The case was adjourned in order that the legal point raised might be brought before the Board of Trade.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Water Gas.

SIR,—Mention was made by Mr. James S. M'Nicol in his paper on "Water Gas," read before the Scottish Junior Gas Association, of trouble due to clinker adhering to the walls of the generator. [See "JOURNAL" for Dec. 2, p. 493.]

As a remedy for this, he might try pointing the joints of the generator and painting the walls with a few coats of "Thermomite" cement, or, better still, lining this part of the wall with 2-in. "Thermomite" bricks. This material is neutral to all slags, and will stand-up to temperatures equal to the oxy-acetylene flame. During the war this material was used, with excellent results, for lining high-pressure water-gas heated furnaces; and though expensive, it saved its cost several times over—about 1d. per inch cube.

The material should find many users in the gas industry—for instance, for tubes or blocks in regenerator shells—as it has three times the conductivity of fire-clay, and is stronger, and therefore can be made lighter.

I take this opportunity of thanking Mr. M'Nicol for his very interesting paper.

39, *Victoria Street, S.W., Dec* 29, 1919. C. B. TULLY.

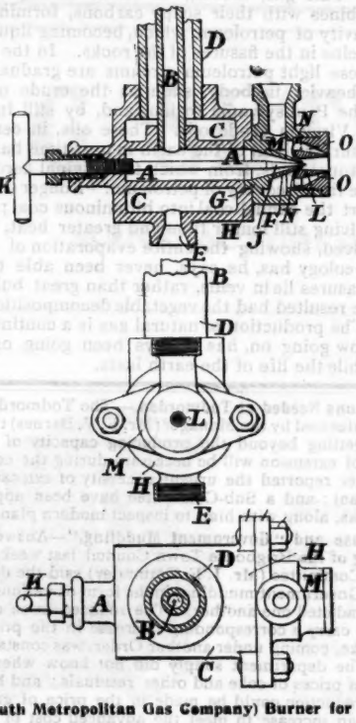
REGISTER OF PATENTS.

Burners for Liquid Fuel.—No. 135,583.

SOUTH METROPOLITAN GAS COMPANY, and KIRBY, A., of the East Greenwich Gas-Works.

No. 19,464; Nov. 26, 1918.

These burners are adapted for use with pitch mixtures. The burner consists of a steam-jacketed pitch chamber, with a nozzle (into which enters a needle for regulating the delivery of the pitch) extending into a pipe. Surrounding it is a steam-chamber, from which two passages extend—one between the inner end of the pipe and the nozzle and the other to the outer end of the pipe. Upon the inner end of the nozzle is a collar which fits into a circular recess in the walls of the steam-jacket, and from the walls extend flanges bolted to corresponding flanges on the walls of the steam-chamber surrounding the nozzle. This construction allows the nozzle and steam-chamber to be removed, so as to give easy access to the pitch-chamber for cleaning purposes.



Kirby's (South Metropolitan Gas Company) Burner for Liquid Fuel.

A burner made in accordance with the invention is shown in longitudinal section, end elevation, and plan.

A is the pitch chamber, having an inlet pipe B and a steam-jacket C, with a supply pipe D surrounding the inlet pipe, and an outlet pipe E. F is a nozzle having a collar G fitting into a recess in the wall of the steam-jacket, into which nozzle extends the needle valve J, which screws into the end of the pitch chamber—its position within the nozzle being regulated by the handle K. The outer end of the nozzle extends into a pipe L. Surrounding the nozzle is a steam-chamber M, from which lead passages N and O—one extending between the nozzle and the pipe L and the other to the outer end of the pipe.

Treating Coal, Water, and Other Gases and Removing Substances contained therein.—No. 135,577.

PENNINGTON, A. J., of Manchester, and LAMB, M. C., of Tower Bridge Road, S.E.

No. 19,386; Nov. 25, 1918.

The inventors propose to mix with ordinary coal gas the hydrocarbon gases and volatile matters obtained from the destructive distillation of bones or leather. They also employ the oils, volatile matters, and hydrocarbon gases for enriching water gas and other gases having low luminous value. Alternatively, to remove naphthalene from coal gas, the condensed oils and fractions referred to are used as solvents to extract it. To carry the process into effect it is convenient that the oils associated with the gases should be trapped and collected over water. Such obtained oils are fractionated, and the portions having comparatively high boiling points are selected as being the most effective in use.

The gases laden with naphthalene and anthracene are passed through the oils or otherwise brought into intimate contact with them; the temperature being kept "as low as convenient during this operation."

By passing steam through the residual carbonaceous matter (as obtained in the initial distillation process) while in a heated condition, water gas is evolved which can be economically mixed with the gases obtained by the initial distillation or utilized as fuel, in a furnace constructed for supplying the heat necessary to conduct the initial drying and distillation of the crude material to be operated upon.

Alternatively, the residual coke and other *débris* left in the retort is dealt with by passing superheated steam through the mass while in the heated retort—whereby the blue water gas is produced, which is utilized by mixing with the gaseous hydrocarbon products of the initial distillation.

This mode of procedure in treating carbonaceous matter in a heated condition with superheated steam is said to be peculiarly adapted, owing to the high proportion of mineral matter intermingled with the carbon, to the treatment of the solid residual matter remaining in the retorts after the dry distillation of leather boot soles or of bone material.

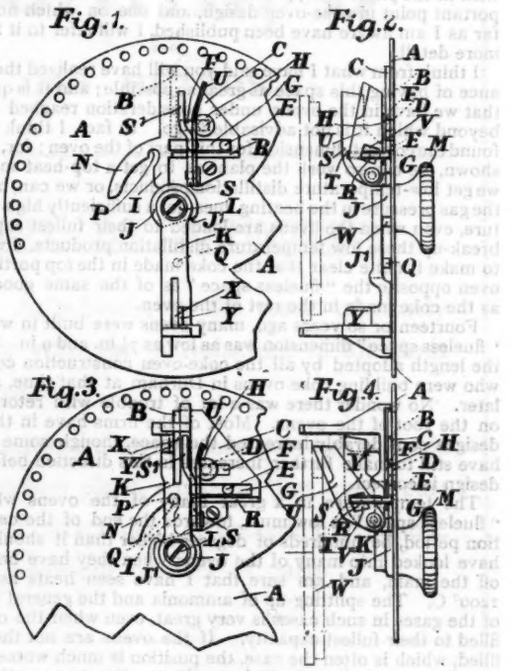
Coin-Freed Mechanism.—No. 135,654.

GLOVER, THOMAS, of Edmonton.

No. 20,718; Dec. 12, 1918.

This invention relates to coin-freed mechanism in which the coin engages a carrier and the teeth of a wheel whereby, on the movement of the carrier, the wheel is revolved on its axle the required distance to actuate the mechanism—such as is described in patent No. 25,272 of 1894. The object of the invention is to lock the toothed wheel while the coin-slot is open—thereby preventing any fraudulent manipulation of the mechanism by wires or tools inserted in the slot—and to close the slot immediately the coin-carrier is moved and during the whole of the movement. The invention is described in connection with the device set forth in the 1894 patent.

Fig. 1 is a face view, and Fig. 2 a side view of the appliances affixed to a price-changer plate, and showing the coin-slot closed and the coin-carrier at rest. Figs. 3 and 4 are similar views, but showing the appliances in position with the coin-slot open—the coin-carrier being ready for receiving the coin.



Glover's Coin-Freed Meter Mechanism.

To the back of the price-changer plate A, having the slot B in which the coin is inserted, there is secured a sliding plate C, so positioned that when moved fully in one direction it opens the coin-slot (fig. 3),

and during the whole of the movement in the reverse direction the slot will be closed (fig. 1). The plate C preferably slides on pins D E engaging slots F G therein, so that it moves in a straight direction. The pin D has a head H, to return the plate C to the plate A. The plate C has an extension I reaching to, and engaging, the hub J of the coin-carrier arm K, which is pivoted at L to the price-changer plate and is provided with a handle M, by which the carrier is operated. Projecting from the edge of the plate C (and just above the extension) is a quadrant N, having a recess P (near the end) coinciding with a recessed portion of the extension I; and on the arm K of the coin-carrier projects a pin Q, which rides against the quadrant and engages the recessed portion of it so as to move the plate C to-and-fro over and from the coin-slot B. On the plate C, at one side of the extension I, is formed an angled strip R; and to the price-changer plate next to this angled strip is secured an arm S with a slot T, through which the strip passes. To this arm a lever U is pivoted, provided with an opening V through which the strip passes, as also an arm forming the means for locking the toothed wheel W. The boss J is provided with a cutaway portion J^1 in such a position that as the coin-carrier arm K reaches the slot B, the edge of it is freed from the end of the extension I, which allows the plate C to be moved; but in all other positions the extension I rides against the boss, and the plate is prevented moving to open the slot by reason of the end of the extension being on the opposite side of the vertical line passing through the pivot L to the main body of the plate C and engaging the boss J.

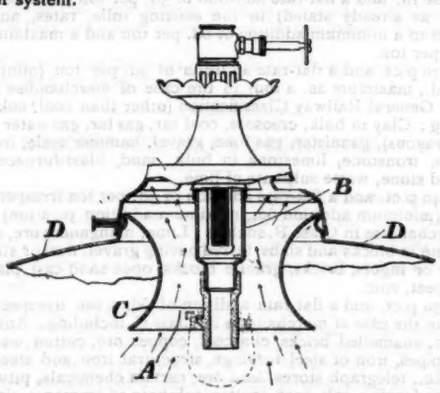
In action, and to open the coin slot ready for insertion of a coin, the lever U, being free from the wheel W (as in fig. 1), the coin-carrier is revolved backwards by the handle, and its pin Q slides along the quadrant and enters the recess P; and, just as the pin reaches the recess, the cutaway portion of the boss J reaches the extension I, and frees it. The pin Q will then act upon the plate C and push it over to open the coin-slot. In so doing, the strip R acts upon the lever U and moves it over, away from the price changer-plate A for one edge to enter between two teeth of the wheel W (see fig. 4), thus connecting the mechanism. This is done just before the coin-slot commences to be opened; and by the time the slot is opened the lever U has fully engaged the teeth of the wheel; but the wheel is locked by the lever U immediately the lever engages the teeth of the wheel. A coin is then dropped through the slot B into the carrier X (which it engages) and also between two teeth of the wheel W. On a reverse motion of the handle and coin-carrier, the pin Q on the coin-carrier arm engages the other side of the recess P and moves the plate C to cover the coin-slot. At the first movement of the plate C, the strip R acts upon the lever U and removes it from the wheel W and allows it to be revolved; the plate C being moved until the pin leaves the slot. The sliding plate covers the slot with the end of the extension I engaging the round edge of the boss J. The arm S acts as a stop for the coin-carrier, and its upper part S^1 together with a wall Y on the coin-carrier K forms a guide for the coin.

Incandescent Gas-Burners.—No. 135,901.

ETNA LIGHTING AND HEATING COMPANY, LTD., and PROSSER, H. R., of Birmingham.

No. 19,438; Nov. 26, 1918.

This invention is aimed at providing for the heating of the gas or mixture prior to its combustion within the mantle, while making provision for the products of combustion being conveyed away as rapidly as possible and controlling the flow of air and combusted gases through the burner system.



Prosser's (Etna Lighting Company) Incandescent Gas-Burner.

Around the mixing-tube a "tubulus" A is provided, which is retained by the same means as are utilized for retaining the globe or shade. The tubulus extends downwardly to about the level of the mantle-ring C, and is of nearly the same diameter as the upper edge of A, as a result of which the gases are inwardly thrown against the exterior of the mixing-tube B, as illustrated by the arrows.

This arrangement is advantageously used in conjunction with a more or less flat globe or shade D—one that functions as a top reflector and the converging part of which is wider at the bottom than the top, and terminates at a position above the mantle, where it extends outwardly in the form of a disc.

Coin-Freed Mechanism.—No. 135,655.

GLOVER, THOMAS, of Edmonton.

No. 20,719; Dec. 12, 1918.

In this coin-freed mechanism the coin-carrier is composed of two cups arranged on the operating shaft and slotted to receive the coin—one cup being fixed to the shaft while the other is loosely arranged on it, but connected by a train of wheels to the operating mechanism—the object being to positively lock the movable cup until the coin has been inserted in the carrier, and the carrier moved a short distance, "thereby preventing any fraudulent tampering with the mechanism."

A perspective view of the two cups and an end elevation are given.

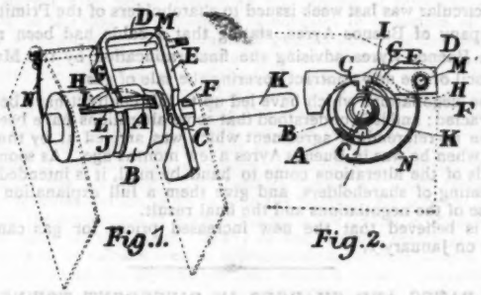


Fig. 1. Fig. 2.

Glover's Coin-Freed Mechanism.

The two coin slots A in the loose cup B are made wider than necessary to receive the coin; and, adjacent to the slots (or at any part on the end wall) recesses C are formed. To some part of the casing I is pivoted a lever D—one leg E being longer than the other and provided with a lug or projection F, which will engage either of the recesses in the cup B. The other end G is angled or curved as at H for the coin to have action against during its travel for the mechanism to be operated so as to lift the other leg E and free the projection F from the recess C. The lever D positions itself by its own weight, or is assisted by a spring.

In action, the lever D is so positioned that the lug F engages a recess C, and the end H is in the path of the coin I. The loose cup is then in a proper position, and on the coinciding of the other cup J with it, and a coin I inserted, the cups B J are held to move together. A handle on the shaft K is now moved, and the coin being held in the narrower slot L of the cup J, its edge acts upon the edge H of the member G of the lever D, and lifts the lever about its pivot pin M; the lug F being lifted clear of the recess C. During this movement the coin has not operated the loose cup B, by reason of its slot A being wider and the coin having to travel across it before engaging the wall when the cups B J and the coin I move together—the coin leaving the curved edge H of the lever D and the lug F riding on the edge of the cup. When the cups have been revolved their full distance (the lug F, dropping into the next recess C_1 to hold the loose cup fast with the other slot positioned to receive a coin), the coin is discharged, and the cup J can be returned to position its slot to coincide with the slot in the cup B to receive a fresh coin. N is the usual guide along which the coin travels before being discharged.

As will be understood, the cup B is connected by suitable gear to the operating mechanism.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official List" for Dec. 24.]

Nos. 31,313—32,035.

ANDERSON, C. E.—"Valves and cocks." No. 31,525.
BAGG, E. A.—"Taps and valves." No. 31,778.
DOUGLAS, R. P.—"Apparatus for the manufacture of sulphate of ammonia." No. 31,970.
DUCKHAM, Sir A. M.—"Introduction of steam into vertical retorts or ovens." No. 31,799.
ELLERAY, R. H.—"Incandescent gas-burners." No. 31,458.
ELLISON, P.—"Gas-stoves." No. 31,628.
ESSEX, G. J.—"Gas-burner." No. 31,462.
FLETCHER, RUSSELL, & Co.—"Gas-burners for heating and cooking." No. 31,728.
FORSHAW, A.—See Fletcher. No. 31,728.
FRANKLIN, P. D.—See Essex. No. 31,462.
GORMAN, F. G.—"Gas-mantle supports and burners." No. 31,686.
GUSTAFSSON, C. A.—"Apparatus for issuing receipts from gas-meters, &c." No. 31,695.
HANSFORD, J.—"Prepayment mechanism for gas-meters, &c." No. 31,465.
HANSFORD METER COMPANY.—See Hansford. No. 31,465.
KNIGHT, J.—"Gas oven or stove." No. 31,840.
LAND, T. G.—"Union for lead, &c., pipes." No. 31,457.
LUNDBERG, E. K. H.—"Self-closing valves." No. 32,024.
MARSHALL, W.—"Manufacture of incandescent gas-mantles." No. 31,853.
OLDHAM, G. T.—See Essex. No. 31,462.
SLOMAN, J.—"Economizer for upright gas-mantles." No. 31,508.
SMILES, J. E.—Gas-mantle supports and burners." No. 31,686.
SOC. INDUSTRIELLE DE PRODUITS CHIMIQUES.—"Process for recovering ammonia from coke-oven, &c., gases." Nos. 31,688, 31,689.
SOUTH METROPOLITAN GAS COMPANY.—"Means for preventing re-insertion of tickets in cabinet, &c." No. 31,917.
TURNER, P.—"Incandescent gas-burners." No. 31,313.
WEYMAN, J. E.—"Atmospheric gas-burners." No. 31,496.
WILKINSON, G.—"Electrically-controlled valves for gas, &c." No. 31,876.
WILSON, W. W.—See Anderson. No. 31,525.
WOODALL, DUCKHAM, AND JONES.—See Duckham. No. 31,799.

MISCELLANEOUS NEWS.

BUENOS AYRES MUNICIPAL GAS CONTRACT.

A circular was last week issued to shareholders of the Primitiva Gas Company of Buenos Ayres, stating that a cable had been received from Buenos Ayres advising the final ratification by the Municipal Council of the new contract covering the sale of gas.

The negotiations which have led up to this contract have been very protracted; and it is understood that some alterations have been made in the ad-referendum agreement which was arrived at by the Chairman when he was in Buenos Ayres a few months ago. As soon as full details of the alterations come to hand by mail, it is intended to call a meeting of shareholders, and give them a full explanation of the course of the negotiations and the final result.

It is believed that the new increased prices for gas came into force on January 1.

RATES AND CHARGES IN DIFFERENT TOWNS.

Annual Statistics of Mr. Davies.

Another has been added, by the issue of the thirty-fifth annual statement, to the series of statistics compiled by the Borough Treasurer of Preston (now Mr. W. Allison Davies) with regard to the rates levied in various towns, together with the charges for domestic supplies of gas, water, and electricity, and profits and losses on municipal undertakings by which rates have been reduced or increased, in a number of representative Provincial towns and some Metropolitan boroughs. The statement (which covers the financial year 1919-20) is framed with the object of showing the actual rates levied in different towns; and only profits and losses which affect the rates are stated. The charges quoted for gas, water, and electricity are those made against the ordinary ratepayer for household purposes only. Particulars are given this year for the first time with reference to the acreage of the several towns, the deduction allowed for repairs in the case of houses of an annual rental value of £20, and the product of a penny rate. The analysis of the rates has also been considerably extended, with the object of furnishing particulars as to the cost of the more important services.

The number of towns with regard to which information is given in the present return is 140, which is two less than a year ago. Taking first the rateable value of the places that are mentioned, the highest figures shown are: Westminster, £7,036,247; Liverpool, £5,120,128; Birmingham, £5,059,669; Manchester, £4,841,922; Kensington, £2,455,850; Leeds, £2,280,926; and Sheffield, £2,164,800. The smallest are: Clitheroe, £52,960; Mossley, £66,288; Kendal, £71,206; Newark, £81,247; Brighouse, £90,007; Bacup, £90,368; Haslingden, £90,810; Ilkeston, £91,256. The populations (estimated) range from 910,000 in the case of Birmingham, to 12,200 in that of Clitheroe.

Looking down the tables, it is noticed that there has again been a general rise in the total rates levied; the increases over the previous year being in many cases very heavy indeed. The towns included in the returns in which the figure is now over 10s. in the pound are as follows: Merthyr Tydfil, 17s. 5d.; West Ham, 15s. 7d.; East Ham, 15s. 6d.; Stoke-on-Trent, 15s. (approximate average rate); Blackburn and Ilkeston, 14s. 4d.; Macclesfield, 14s. 3d.; Mansfield and St. Helens, 14s.; Colchester and Norwich, 13s. 11d.; Brighouse, Chorley, Nelson, Salford, Stalybridge, Warrington, and West Bromwich, 13s. 6d.; Hull (approximate average) and Nuneaton (approximate average), 13s. 5d.; Walsall, 13s. 3d.; Ashton-under-Lyne, 13s. 2½d.; Mossley and Rochdale, 13s. 2d.; Preston, 13s. 1d.; Bacup, Colne, Heywood, Nottingham, and Stockport, 13s.; Wakefield, 12s. 11d.; Halifax, 12s. 10d.; Oldham, 12s. 8d.; Liverpool (approximate average), 12s. 7½d.; Swansea (approximate average), 12s. 6½d.; Grimsby, Lowestoft, Middlesbrough, Rotherham, and Wigan, 12s. 6d.; Sheffield (approximate average), 12s. 5½d.; Chatham, 12s. 4d.; Batley, Lincoln, and Yarmouth, 12s. 2d.; Manchester and Middleton, 12s. 1d.; Hyde, 12s. 0½d.; Birmingham, Bradford, Bristol, Darwin, Leeds, and Smethwick, 12s.; Rawtenstall, 11s. 10d.; Bromley, 11s. 8½d.; Haslingden and Leigh (Lancs.), 11s. 8d.; Swindon, 11s. 7d.; Burton-on-Trent, Canterbury, and York, 11s. 6d.; Birkenhead and Leicester, 11s. 5d.; Carlisle, Northampton, Reading, and Wimbledon, 11s. 4d.; Coventry, Harrogate, Southampton (approximate average), and Stafford (approximate average), 11s. 3d.; Ipswich and Wolverhampton, 11s. 2d.; Stockton-on-Tees, 11s. 1d.; Accrington, Chesterfield, Derby, and Keighley, 11s.; Gateshead, 10s. 11d.; Burnley and Bury, 10s. 10d.; Scarborough, 10s. 9d.; Bolton (approximate average), 10s. 8½d.; Bootle, Crewe, Luton, and Widnes, 10s. 8d.; Plymouth, 10s. 7½d. (approximate average); Exeter, Hastings, Sunderland, and West Hartlepool, 10s. 6d.; Clitheroe, 10s. 4d.; Dewsbury (approximate average), 10s. 2½d.; Chester and Newport (Mon.), 10s. 2d.; and Eccles, 10s. 1d. Those rated at less than 8s. in the pound are: Blackpool, 6s. 6d.; Eastbourne, 6s. 7d.; Bournemouth, 6s. 9d.; Oxford, 6s. 11d.; Wallasey, 7s. 2d.; and Kendal, 7s. 6d.

By transfers from municipal undertakings, &c., the rates levied in the following towns have been reduced to the extent of 1s. or more in the pound: Yarmouth, 2s. 5d.; Wallasey, 1s. 7½d.; Halifax, 1s. 6¾d.; Liverpool, 1s. 2¾d.; and Leeds, 1s. 0½d. The total number of towns in the statistics in which the rates have been decreased by transfers from municipal undertakings is 92. The instances in which profits transferred from gas reached £10,000 are: Belfast, £11,400; Birmingham, £15,000; Halifax, £16,138; Manchester, £31,204; Nottingham, £18,094; Salford, £10,000; and Wallasey, £11,500.

Turning to the other side, it is seen that deficiencies on municipal undertakings have necessitated increases in the rates in 78 cases, which is exactly the same number as a year ago. Along with these deficiencies on some undertakings, there were at the same time, in many cases, profits on others which assisted to relieve the rates. Birmingham made a profit of £50,000 on gas, electricity, and tramways, and a loss of £122,521, of which £100,000 was due to water supply. Bristol had a deficiency of £76,000 under the heading of docks. At Preston, also, of a total deficiency of £70,291, £64,000 is put down to navigation and dock works. Of losses at West Ham totalling £71,240, electricity was responsible for £8643. The only instance in which a loss appears under gas is Chorley, where the figure is no more than £42. On the other hand, there are about twenty cases in which electricity figures. The largest electricity deficits are East Ham, £9173; West Ham, £8643; and Ipswich, £6760. The amounts in the pound by which the rates were increased by deficiencies on municipal undertakings totalled 1s. or more in the following cases: Preston, 3s. 3¾d.; Bacup, 2s. 6½d.; Harrogate, 2s. 2½d.; Heywood, 1s. 10½d.; Stockport, 1s. 5½d.; Middleton, 1s. 4½d.; St. Helens, 1s. 3½d.; Middlesbrough, 1s. 2¾d.; Stalybridge, 1s. 2½d.; Halifax, 1s. 2d.; West Ham, 1s. 1¾d.; Keighley, 1s. 1d.; and Colne, 1s. 0½d. As a rule, water bulks largely in these figures.

Coming now to the charges made for gas and electricity in the different towns which are included in the statistics, it may be said that there are this year about eighty places named in which the net charge per 1000 c.ft. for a supply of gas for household purposes only is 4s. or more, as compared with thirty twelve months ago, and three the year before that. The instances of a charge of 5s. or more are: Lowestoft, 8s. 6d.; Shrewsbury, 6s. 3d.; Yarmouth, 6s.; Batley, 5s. 10½d.; Canterbury and Hastings, 5s. 6d.; Richmond (Surrey) and Swindon, 5s. 3d.; Chatham, 5s. 2d.; Wigan, 5s. 1½d.; Ilkeston, Leigh (Lancs.), Mansfield, Newport (Mon.), and Walsall, 5s. Domestic gas supplies, according to the tables, could at the date of their compilation be had at 2s. 6d. or less per 1000 c.ft. at: Middlesbrough, 2s.; Sunderland, 2s. 2d.; Crewe, 2s. 5d.; Wallsend, 2s. 5¾d.; and Bath, 2s. 6d.

The highest net charge shown in the tables per Board of Trade unit for a domestic supply of electricity is 9¾d. The cases in which the charge is 8d. or over are: Hastings and Hull, 9¾d.; Yarmouth, 9½d.; Bromley, Chelsea, and Scarborough, 9d.; Ealing, 8¾d.; Carlisle and Cheltenham, 8½d.; Bath, Bournemouth, Burton-on-Trent, Chatham, Croydon, Derby, Eccles, Hampstead, Hornsey, Hove, Kendal, Leamington, Macclesfield, Newport (Mon.), Oxford, Peterborough, Preston, Rochdale, Shrewsbury, Swindon, Wakefield, Walsall, West Ham, Wimbledon, and Worthing. The charge is 4d. at Chester, Darlington, Middlesbrough, and Widnes.

THE REVISED RAILWAY RATES.

Useful Extracts for Gas Undertakings from the Official Schedule.

Official notices have been issued by the Railway Clearing Houses of London and Dublin, on behalf of the railway companies, regarding the alterations in rates, &c., that are to come into force from the 15th inst. The increases in the rates in every case are stated in percentages of present rates, besides a flat-rate addition per ton, irrespective of distance. In some instances the minimum or maximum (or both) additions are fixed. Extracts from the Schedule are as follows:

ADDITIONAL CHARGES.

Part I.—(1) Coal, Coke, and Patent Fuel.—There will be a 25 p.ct. increase in, and a flat-rate addition of 3d. per ton (irrespective of distance, as already stated) to the existing tolls, rates, and charges, subject to a minimum addition of 6d. per ton and a maximum addition of 2s. per ton.

(2) 30 p.ct. and a flat-rate addition of 3d. per ton (minimum addition 6d., maximum 2s. a ton) in the case of merchandise in Class A of the General Railway Classification (other than coal, coke, &c.), including: Clay in bulk, creosote, coal tar, gas tar, gas water (in owners' tank-wagons), gannister, gas lime, gravel, hammer scale, iron ore, iron pyrites, ironstone, limestone in bulk, sand, blast-furnace slag, undressed stone, waste sulphate of lime.

(3) 40 p.ct. and a flat-rate addition of 3d. per ton irrespective of distance (minimum addition 6d., maximum addition 3s. a ton) in the case of merchandise in Class B, such as: Lime, manganese ore, cement and concrete in blocks and slabs, tarred paving gravel, iron or steel blooms, billets or ingots, bricks, granite blocks, open sand cast plates, slates, tiles, peat, zinc.

(4) 50 p.ct. and a flat-rate addition of 6d. a ton irrespective of distance in the case of merchandise in Class C, including: Antimony ore, arsenic, enamelled bricks, charcoal, copper ore, cotton waste, glazed drain pipes, iron or steel forgings, structural iron and steel for buildings, &c., telegraph stores, lead ore, certain chemicals, pitwood, posts for wire fencing, salt, soot, spelter, sulphate of ammonia, timber, wire, zinc ingots, plates, sheets and rods.

(5) 60 p.ct. and a flat-rate addition of 1s. per ton, irrespective of distance, in the case of merchandise in Classes 1 to 5, including; Locomotive axles and wheels, bolt and nut machines, boring, drilling and planing machines, glue, grease in casks, hydraulic machinery, railway materials like railway buffers, oils (not dangerous) in casks or drums, boilers and fittings, buckets and pails, paints in casks, paraffin and petroleum oils in owners' own tank-wagons, ropes, sacks, bars and bundles of steel, boring tools, sheet steel, punching, shearing and slotting machines for metal work, castings, pumps, cast-iron radiators, cranes, electric accumulators and insulators, metal tubes, varnish, weighing machines, iron and steel drums for collieries, roofing felt, agricultural and portable engines, ploughs and harrows, gas-engines, iron gates, hollow ware, hardware, lamps, electrical instruments.

(6) 60 p.ct. in the case of rolling stock.

(6a) 60 p.ct. road vehicles, with an additional 2s. 6d. per vehicle for vans and caravans.

(7) 100 p.ct., small parcels by goods train and returned empties when not a full truck load.

(8) 50 p.ct., returned empties in full truck loads from one consignor or to one consignee; also merchandise and parcels conveyed by passenger train.

(9) No increase.—Basic slag and lime for agricultural purposes.
(10) 50 p.ct. in the case of all traffic not falling within the foregoing descriptions.

It should be noted that in any of the above cases the companies have powers to charge the higher rates applicable to the class next on the ascending scale if the consignments do not come up to a certain specified weight.

Part II.—The following additions to the existing charges will also be made:

(1) In the case of provision of trucks for the use of traders when not included in the conveyance rates: An addition of 50 p.ct., with a minimum charge of 9d. per ton.

(2) For collection or delivery of merchandise conveyed by merchandise train: 1s. 6d. per ton for collectfon, 1s. 6d. per ton for delivery, in addition to the percentage increases of, and flat-rate additions to, any "collected" and/or "delivered" rate.

In cases where any addition to the existing ton rate or charge involves a fraction of a penny to be charged under this schedule, the fraction, if less than one-halfpenny, will not be charged, and if the fraction be one-halfpenny or more it will be charged as one penny.

DEMURRAGE RATES.

The Railway Clearing House also gives notice of new charges to be made for the detention of wagons, &c., before and after transit over the railway. The charges are for each of the first two days after the expiration of the free period, and for each subsequent day (the latter charge shown in brackets in each case):

Wagons.—Not exceeding 18 tons of capacity, 3s. (5s.); 18 to 20 tons capacity, 4s. (6s.); 20 to 30 tons capacity, 6s. (9s.); of capacity exceeding 30 tons, 10s. (15s.).

Specially Constructed Wagons.—Above 15 tons and under 20 tons, 6s. (9s.); 20 to 30 tons, 12s. (18s.); 30 tons and above, 20s. (30s.).

The free periods allowed for loading and unloading are to be:

(*a*) Wagons supplied empty for loading with merchandise (other than coal, coke, or patent fuel for shipment), at stations, private sidings, docks, wharves, &c., one day, exclusive of the day on which the wagon is placed at the trader's disposal.

(*b*) Wagons supplied empty for loading with coal, coke, or patent fuel for shipment at private sidings, two days, exclusive of the day on which the wagon is placed at the trader's disposal.

(*c*) Loaded wagons after conveyance.

(1) At stations: I.—Traffic other than coal, coke, or patent fuel, two days, exclusive of the day of receipt by the trader of notice of arrival. II.—Coal, coke, or patent fuel, three days, exclusive of the day of receipt by the trader of notice of arrival.

(2) At ports (shipment traffic only), four days, exclusive of the day of arrival.

(3) At private sidings, docks, wharves, &c.: I.—Traffic other than coal, coke, or patent fuel, two days, exclusive of the day on which the wagon is placed at the trader's disposal. If reloaded an additional day shall be allowed. II.—Coal, coke, or patent fuel, three days, exclusive of the day on which the wagon is placed at the trader's disposal. If reloaded, an additional day shall be allowed.

The number of days allowed for the return of any covering sheet will be the same as for the wagon with which it was supplied. The demurrage rate for each sheet will be 6d. for each of the first two days and 1s. for each subsequent day.

Any wagon or sheet used for internal purposes will be deemed to have been detained, and the charges specified in this schedule will be charged in respect of such wagon or sheet so used, notwithstanding that such use may have taken place during the free periods hereinbefore specified.

Notice of arrival may be given orally or in writing, and may be sent by post, telegram, or telephone.

ENGLISH OILFIELDS PROGRAMME.

The principal features of the annual meeting in London last week of English Oilfields, Ltd., were statements made by the Managing-Director (Dr. W. Forbes-Leslie) and the Consulting Chemical Adviser (Dr. Edward Burnet) as to the work accomplished, and that which is contemplated.

After remarking upon the increase in the capital to £1,500,000, Dr. Forbes-Leslie said that sufficient positive data had been obtained to allow a very conservative estimate to be made of the tonnage available for treatment in the Company's property. It came to the very great figure of 2000 million tons of shale, having an estimated average content of from 30 to 60 gallons of oil per ton raised, and comprehended in seams of a workable thickness. During the course of the experiments on Norfolk shales with a number of retorts, yields had been obtained from 32 up to 41 gallons of oil per ton retorted; but it had been found that, owing to the unexpectedly large quantities of light oils and spirit contained in the shales when freely mined, this larger yield in itself did not adequately represent the oil content, and efforts have lately been directed to first conserve, and then obtain by specially designed retorts, these valuable volatile products. After a number of firms had been asked to tender for the bye-product plant at Setch, the contract was finally given to Messrs. W. C. Holmes & Co., of Huddersfield. The actual contract was to deal with 20 million c.ft. of gas per 24 hours, with power to extend it so as to include another 10 millions, making a total of 30 million c.ft. The plant consists of annular condensers (atmospheric in principle), surface condensers (tubular in type), an adequate number of large exhausters to deal with the enormous quantity of gas developed, several large tar-extractors, and a number of Livesey washers, ammonia scrubbers, and benzol scrubbers. From this point in its progress, the gas goes back to the retorts and power plant; while the crude oil passes into the refining plant, and the ammoniacal liquor into the sulphate plant for treatment. The freehold site was extended by the acquisition of more ground; so that a works site, containing retorts, condensing and refining plant, tankage and distributing sheds, cement works, sulphate of ammonia works, &c., with sidings for adequate truckage, was obtained. The works to be placed on the site would, he believed, be the largest retorting, condensing, and refining plant in England.

EXPERIMENTS ON RETORTING.

Dr. Burnet, after briefly explaining the process of retorting shale, went on to say that the percentage of volatiles in a sample of shale affords a rough idea of the number of gallons of oil per ton that can be reasonably expected, and is a factor of considerable importance in estimating the probable value of the shale as a source of oil. But all the volatiles are not condensable; and the greater the amount of permanent gas produced, the less the amount of oil. The type of the retort, the manner of heating, and the readiness with which the gaseous products are removed out of harm's way, are indissolubly associated in determining the relative proportions of condensable and permanent gas produced. The Norfolk shales are indubitably very rich in volatiles—much more so than the Scottish, on account of the fact that the proportion of organic matter in the former is considerably greater than in the latter. Many of the Norfolk seams give from 60 to 70 p.ct. of volatile matter, representing a possible output of oil of at least 80 to 100 gallons per ton; while a volatile percentage of over 40 gallons is common. The average amount of oil produced from the Scottish shales is 23 gallons per ton. With suitable retorting, 60 gallons per ton of Norfolk shale is no extravagant estimate. Some seams can certainly do much better. But the choice of working is naturally governed by the environment; and it is not always politic to work the richest strata first. As a rule, the yield of ammonia from the Scottish shales varies inversely with that of the oil; those which are rich in the latter being poor in the former. This does not hold good in Norfolk, on account of the higher nitrogenous constituents. From 60 to 70 lbs. of ammonium sulphate per ton have been recovered from the Company's shale; but the amount naturally varies with the general character of the individual seam. The spent shale from the retort is usually regarded as a necessary nuisance, but there are hopes of turning even this to advantage. Owing to a capital supply of suitable chalk and clay on the properties, a considerable revenue may be anticipated from the manufacture of cement, in which the spent shale would be utilized.

The matter of a suitable retorting method has received the careful attention of the scientific staff. While the Company are alive to the necessity of devising a process which will enable the refiner to produce in greatest abundance the products for which there is the biggest demand, they have the additional responsibility of devising a retort which will not convert into permanent gases the lighter oils, so susceptible to disassociation when overheated. He hopes to be in a position shortly to publish the details of such a retort, which may have a most important bearing upon the development of the shale-oil industry in this country. The crude oil of Norfolk at ordinary room temperature is limpid in consistency, and has a specific gravity approaching that of water. On fractional distillation it yields, under suitable conditions, from 10 to 20 p.ct. of gasolene, and from 40 to 50 p.ct. of kerosene. The residue above 270° C. is about 40 p.ct. The residue is usually liquid at room temperature, but after distillation up to 300° C. a bituminous residue is left, which has a specific gravity of 1·170 and a melting-point of 82° C. Of this, nearly 90 p.ct. is soluble in carbon disulphide; and the value of this material as a binder in road-making—particularly where motor-traffic is great—can scarcely be exaggerated. The various fractions obtained by redistilling the crude oil have now to be refined. If retorting is a science and art, refining is not less so; and the moment attention is turned to this important branch of the industry, one begins to appreciate the fact that the experience gained in the Scottish refineries is of comparatively little assistance, on account of the specific differences between the respective oils. Time and experience alone will enable one to determine definitely the exact cost of producing the finished product. Shale oils differ from crude petroleum in that they contain certain organic compounds characterized by an odour which is not calculated to enhance their value. Moreover, they are more highly unsaturated than petroleum. The unsaturated groups are removed, in the process of refining, by means of treatment alternately with acids and alkalies; and their elimination means a considerable amount of loss. The average refining loss for Scottish shale oil is about 25 p.ct., and that of Norfolk oil is much about the same, or possibly a little more. Now, instead of removing the unsaturated compounds, the ideal method of treatment would be to induce them to take up more hydrogen, and bring them to the hydrogen standard of the more valuable constituents. Several methods of effecting this have been accomplished; but the time is not yet ripe for putting these into practice on a large commercial scale. The depolymerization of heavy oils, reconstituting them into motor spirit of great commercial value, has also been accomplished with much success.

In conclusion, Dr. Burnet expressed confidence that the profits will show an enormous return upon the capital.

Messrs. Falk, Stadelmann, and Co., of Farringdon Road, E.C., have just issued a new gas accessories list. The range of small brass gas-fittings is very comprehensive; every endeavour having been made to meet the requirements of gas companies and dealers. Of all the items illustrated in this section large stocks are maintained; and the firm have also adequate stocks of wrought-iron tubes and fittings and malleable fittings. The catalogue includes a small range of tools of everyday use for the gas-fitter.

The Davis Gas-Stove Company, Ltd., state that, while barely twelve months ago the whole of their activities were still absorbed in completing Governmnent contracts for munitions of war, reorganization for peace production is now an accomplished fact—so much so that the Company are able to give immediate delivery from actual stock of all their standard lines, such as gas-fires, gas-cookers, "steamless" radiators, and geysers as well as of much of the miscellaneous and special gas apparatus which they produce. So speedy and complete a "change-over" they regard as highly creditable to all concerned.

VERTICAL RETORTS SUGGESTED FOR PERTH.

Report by Mr. David Vass.

The Perth Gas Committee, on a remit from the Town Council, have appointed a Sub-Committee to make inquiry and report upon the advisability of installing vertical retorts at the gas-works. For this purpose the members will visit places where different systems of these retorts are in operation. When the matter was being discussed by the Council, it was pointed out that, while the introduction of vertical retorts was estimated to cost a sum of £50,000, after allowing for a contribution of £4000 per annum to a sinking fund to cover the repayment of capital and interest, the undertaking would be in a position not only to produce more gas of a more regular quality, but would probably be enabled to reduce the price to the extent of about 5d. per 1000 c.ft. On the other hand, if it was decided to repair the present system of horizontal retorts, the outlay for the work necessary would entail an annual expenditure over five years of £4000, which would require to be met out of revenue, thereby increasing the cost of gas by 4d. per 1000 c.ft.; while at the end of the time the gas-works would be no better than at present, and would only be a patched-up job.

These figures were taken from a full report by Mr. David Vass, the Engineer and Manager, on suggested alterations and improvements of the works, which he prepared upon the instructions of the Gas Committee. Dealing first with the condition of the works at the time of his appointment in 1912, he goes on to say that, about two months prior to his taking up his duties, contracts had been accepted by the Council for machinery, &c., for stoking a portion of the retorts on the De Brouwer system. However, by part working on the old West manual machines and part on the new De Brouwer system, the promised economy could not materialize. Mr. Vass recounts his troubles, and what he did to overcome them. The following is taken from this portion of the report.

Under the instruction and supervision of the contractors' man, the De Brouwer machine was started on charges of six hours' duration, and this continued until the beginning of 1916. Throughout the whole period we had more or less trouble with "jammers"—that is, retorts in which the coke could not be pushed out by the machine, and had to be drawn by hand. Occasionally, when retorts had to be put on eight-hour charges, we found the charges gave less trouble; and this led us in April, 1916, to adopt eight-hour charges throughout, which gave better satisfaction, and was continued until the autumn of 1917, when the coal transport reorganization scheme came into force.

When the reorganization was first mooted, we joined with other gas undertakings in appealing for exemption from the scheme, in view of the advisability of gas-works being supplied with the best gas-making coal in the country; and conferences were held in Dundee, Glasgow, and London with this end in view. But all were equally unsuccessful in procuring exemption.

In the course of these negotiations, we were asked to make trials of the various classes of coal and nuts in the Fife area; and the result of these trials proved that the nuts from the Fife area, with one exception, were unsuitable for working with our machines, as they could not be discharged by the electric ram. The exception was nuts from Blairhall Colliery; but the output from this colliery was very limited. We followed with trials of various coals, screened and unscreened; and after many trials found that screened Hartley coal, used in eight-hour charges, was not workable. We could get the material to work successfully with fresh-drawn coal, by using heavier charges of longer duration, so as to allow the coke to form into the solid mass necessary for mechanical pushing. We now use ten to twelve hour charges; and this is the only solution we have found to enable us to use the Fife coal with the De Brouwer machine. Our trials of the various coals were watched over by a representative of the Fife Coal Master, and also by Mr. Samuel Glover, of St. Helens, on behalf of the Board of Trade Coal Mines Department.

The arrangement has certain advantages and also disadvantages. The advantages are that we are getting a greater yield of gas per ton of coal used, a good yield of tar and ammonia, in all cases much better than can be obtained by hand stoking, and also the quality of coke produced is superior to that produced by hand stoking. On the other hand, the calorific power of the gas is lower than would be obtained by hand stoking. The results as a whole nearly approximate to those of vertical retorts without steaming.

After the extension of the storage bunkers, &c., admitting of working the De Brouwer machine over the full extent of the bench, we began to realize the economy in labour which had been promised.

Number of Men Employed for Handling Coal and Coke (exclusive of Elevating Coal, which may be taken as the same in both cases).

	West's Manual Machines, 1911-12.	De Brouwer Stoking Machines, 1918-19.
Maximum, per 24 hours, midwinter	26	17
Minimum, per 24 hours, midsummer	17	10

Mr. Vass next describes in detail the other portions of the plant, and their condition; and he then goes on to speak of

PRESENT AND FUTURE EXPENDITURE.

The usual lifetime of a setting of horizontal retorts is from 400 to 600 working days. With the machine stoking we can count on the higher figure, which practically amounts to three seasons' working. The regenerator portion runs for the time of two settings at least. The average lifetime of a bench may be taken at sixteen years.

The cost of rebuilding No. 1 bench at present prices would be about £3600, and the rebuilding of four arches in No. 2 bench from £6000 to £6200. To this falls to be added the cost of annual renewals of retorts and settings, &c., at £1920 per annum; and taking this latter for a period of (say) six years, there is an outlay of £11,520—making the expenditure within the next six years £17,720.

Against this, might be considered the cost of erecting a complete bench of vertical retorts capable of producing 1½ million c.ft. of gas per 24 hours—say, £50,000. This sum of £50,000 would cover other items in addition to the retort-bench—such as an up-to-date coal and coke handling plant

The cost of repairs and renewals on a bench of verticals during the first six years, and for some time thereafter, would be very small; and even when they came for regular renewal, it is expected that annual renewal costs will be considerably less than with horizontal retorts.

In addition to the increased yield of gas and of residuals other than coke, there would be one great advantage—namely, regularity in the quality of gas produced, as the process is continuous, and providing the quality of the coal is regular, the quality and quantity of gas produced throughout the 24 hours should also be fairly regular.

In the sum named for a vertical retort-bench, allowance is made for the possibility of being able to raise steam in the setting sufficient to work the bench, which would be a relief to the present boilers.

For the next two years at least expenditure on distributing mains and service pipes would require to be increased by £1000 per annum, in order to overtake the arrears of work of the past five years.

One appendix to the report shows in tabular form the cost of manufacturing gas by vertical retorts as compared with horizontal retorts, using the stoking machines. Under the existing system of horizontal retorts, the manufacturing cost amounts to 1s. 6d. per 1000 c.ft.; and it is estimated that with vertical retorts (allowing £4000 for extra capital charges) the cost will be reduced to 1s. 5d. (without steaming), and by steaming to 24,000 c.ft. the cost of manufacture would be further reduced to 1s. 0½d.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Jan.* 5.

There is little alteration to report in the London market. The position of pitch still remains very firm, and business for forward delivery has been reported at over 90s. f.o.b. makers' works. Creosote is 7½d. net per gallon, in bulk. Tar spirits are unchanged.

Sulphate of ammonia for the Home agricultural trade is £21 7s. 6d. for 24½ p.ct. quality, with 10s. allowance to the dealers, for January delivery.

Tar Products in the Provinces.

Jan. 5.

The average values for gas-works products during the week were: Gas-works coal tar, 46s. 9d. to 51s. 9d. [In the "JOURNAL" for Dec. 16 these prices were, owing to a printer's error, incorrectly given. They should have been 40s. 3d. to 45s. 3d.] Pitch, East Coast, 92s. 6d. to 97s. 6d. per ton f.a.s.; West Coast—Manchester, 70s. to 75s.; Liverpool, 70s. to 75s.; Clyde, 80s. to 82s. 6d. nominal. Benzol 90 p.ct., North, 1s. 11d. to 2s.; crude 65 p.ct. at 120° C., 1s. 1½d. to 1s. 2½d. naked at makers' works; 50-90 p.ct. naked, North, 1s. 10d. to 2s. Toluol, naked, North, 2s. 1d. to 2s. 2d. nominal. Coal tar crude naphtha in bulk, North, 9d. to 9½d. Solvent naphtha, naked, North, 2s. 10d. to 3s. Heavy naphtha, North, 2s. 5d. to 2s. 6d. Creosote, in bulk, North, liquid, 6½d. to 6¾d.; salty, 5¾d. to 6¼d. Heavy oils, in bulk, North, 6¾d. to 7d. Carbolic acid, 60 p.ct., 2s. 6d. to 2s. 7d. Naphthalene, £18 to £22; salts, £6 10s. to £7 10s., bags included. Anthracene, "A" quality, 7½d. to 8d. per minimum 40 p.ct.; "B" quality, nominal.

FROM A MARKET CORRESPONDENT.

Tar Products.

Markets are strong, with prices rising. Pitch continues in great request, and has reached nearly 100s. per ton in London. Provincial prices are also higher, although quotations are rather wider than usual. In Manchester, 85s. is probably the extreme limit; but this, of course, would be equal to nearly 100s. f.o.b. London. In South Wales, prices vary from 92s. to 98s. The year is young, and it is impossible to forecast what may happen later; but we still seem to be a long way off any serious fall in the market. Crude tar is very firm at late rates, and large quantities of prepared tars are wanted. There is very little change in naphthas; but naphthalenes have exhibited more strength, particularly for poorer qualities of crude. Creosote is very firm; and cresylic acid has advanced again. Carbolic acid is strong, and prices difficult to register. It is reported that practically all the old Government stocks have been sold to Japan, and that whatever happens now the market must be better for it. On the other hand, the suggestion that the market has been "made" for the purpose of getting rid of the Government stocks, finds a few supporters. Crystals are nominally 1s. per lb. again. Anthracene has advanced, as also has aniline oil.

The range of quotations is as follows:

Benzol: 90% London 2s. to 2s. 2d., North 1s. 11d. to 2s.; 50-90% 1s. 9d. to 2s. London, 1s. 10½d. North; crude, 60-65% 1s. 5d. to 1s. 7d.; pure, 3s. per gallon naked.

Carbolic Acid: Crude 60's 3s. per gallon nominal; crystals, 40%, 11d. per lb.

Crude Tar: London, 50s. to 55s.; Midlands, 50s.; North, 50s. per ton *ex* works. Refined tar, 32s. 6d. per barrel (free) on rail.

Pitch: London, 90s. to 95s. per ton; East Coast, 85s. to 90s. per ton; West Coast, 80s. to 87s. 6d., with Manchester 85s. per ton and Glasgow 87s. per ton; South Wales, 92s. to 98s. per ton.

Solvent Naphtha: London, 3s. 3d. Provinces average 3s. 4d. per gallon.

Crude Naphtha: Naked, 9d.; North, 8½d. per gallon.

Heavy Naphtha: 2s. 6d. per gallon.

Naphthalene: Refined, £18 to £20 per ton nominal; crude, £8 to £11, according to quality.

Toluol: Naked, 2s. 9d. per gallon nominal. North, 2s. 7d. Pure, 3s.

Creosote: London, 7½d.; North, 6½d. to 7d.; heavy oil, 6d. per gallon in bulk.

Anthracene: 40-45%, 9d. per unit per cwt.
Grease Oils: 18° Tw. (naked), £6 10s. per ton f.o.r. makers' works.
Aniline Oil: 1s. 7d. to 1s. 8d. per lb., drums free.
Cresylic Acid: 95%, 3s. to 3s. 3d.; 97-99%, 3s. 3d. to 3s. 6d. per gallon *ex* works London, f.o.b. other ports.

Latest advices from the United States report a large demand for both toluol and benzol at 32 c. and 30 c. per gallon respectively; aniline oil, 34 c.; aniline salts, 38 c.; salicylic acid, 48 c.; benzoic acid, $1 per lb.; cresylic acid, 97-99 p.ct., 80 to 90 c. per gall.; anthracene, 80 p.ct. (in 100 lb. drums), 90 c. per lb.; naphthalene, 10 c. per lb.; pyridine, $2 to $2.50 per gallon; xylol, 37 c. per gallon. Sulphate of ammonia is $5.50 per 100 lbs. Generally, stocks are low, and producers sold ahead—in some cases, three months. Continued difficulties with coal supply may lead to serious shortage.

Sulphate of Ammonia.

Requirements seem to be on the increase, which is not surprising in view of the automatic advance in the regulated price from month to month. Makers have plenty of orders for execution for some months ahead; and as these will tend to absorb the great bulk of current output, there is little opportunity for any expansion of the export trade at present, in spite of the more profitable terms obtainable in this direction, especially in consequence of the absence of American competition. Export business is a matter of negotiation; and up to £33 per ton is reported paid. Foreign needs are no doubt becoming urgent; but there is no getting away from the fact that there is great scarcity of supply, and were British makers able to increase their output they would find a very ready outlet in foreign and Colonial markets.

On account of the unsatisfactory coal service, the lighting of Accrington thoroughfares by gas is to be discontinued for the present.

The officials and staff of the Goole Urban District Council gas and water undertakings have presented to the late Manager, Mr. L. W. Nuttall, a silver tea service and tray. Mr. Nuttall has, as already intimated, obtained the appointment of Manager to the Pembroke Gas Company.

Practically the whole of the ordinary shareholders in John Wright and Eagle Range, the Richmond Gas Stove and Meter Company, and the Davis Gas-Stove Company have exchanged their shares for shares in the new Company—Radiation, Ltd.; and the Secretary of John Wright and Eagle Range (Mr. T. B. Peattie) intimates that it has now been decided to give the preference shareholders an opportunity of making a like exchange on alternative terms set forth in the circular. Referring to the new Company, Mr. Peattie says that "all the Directors are more than ever convinced that such a union of interests is essential, in view of the unexampled difficulties with which manufacturing concerns are at present faced."

Dublin's Higher Gas Price.

The Alliance and Dublin Consumers' Gas Company last week announced an increase in the price of gas to 6s. 1d. per 1000 c.ft., to take effect as from the dates of meter readings in December and January. This increase, the announcement added, had been rendered necessary "by the recent advance in wages and the further great increase in the cost of production and distribution of gas." But the Company "hope to be in a position at a later date to modify the price as regards gas and coke used exclusively for domestic and household purposes." Mr. W. J. Grey, the Secretary of the Company, informed an interviewer that they could not give their customers the benefit of the reduction in the price of coal, as the Coal Controller had not informed them what proportion of the coal used would be allowed for at the reduced figure. Immediately before the war, the price of gas in Dublin was 3s. 6d. per 1000 c.ft.; recently it was 5s. 6d. In Edinburgh the price was 2s. 6d.; recently it was 5s. 8d. The Dublin Company paid the same wages as those in Edinburgh, which had a great advantage in the proximity of coal supply; while they in Dublin had to pay high freights. With Belfast, where a decrease was being made in the gas price, no comparison could be instituted. The gas undertaking there was a much greater concern, with a larger consumption per customer and a larger total consumption, with a smaller area. The Board of Trade, after due inquiry and examination of figures, authorized the Dublin Company in September last to increase the price by 6d. on the spot; but this increase was of very little use to them. A decision being asked from them on the larger point, they had now given sanction for the present increase.

Aberavon Gas Strike.—The strike of gas workers in the Aberavon and Port Talbot districts has been temporarily settled. It may be recalled that the men came out on strike on the Friday before Christmas, and threw both towns into darkness. On the following day, they resumed work for a week pending negotiations. Their representatives have now agreed to refer the matter in dispute—double time for Sunday—to the National Gas Council; and at a subsequent meeting the men reluctantly agreed to accept this decision.

Railway Rates and Gas Charges.—Owing to the intimated increase in railway rates, and the recent rises in wages and local rates, the Bilston Gas Company and the Willenhall Gas Company have given notice that, as and from the December readings of meters, the price of gas for all purposes will most probably be increased by 6d. and 4d. per 1000 c.ft. respectively. Mr. W. N. Westlake, the Secretary and Manager of the Exeter Gas Company, interviewed on the subject, said that, having regard to the short time that has elapsed since the publication of the increased railway charges, there has not been sufficient opportunity to ascertain definitely how the Company will be affected. It is difficult, however, to see how it can work-out otherwise than by causing an increase in the price of gas.

THE FIRE OF THE SEASON

WHEN, besides economy, efficiency, and hygiene—the fundamental virtues of the modern Main Gas Fires—there has also to be considered the desirability of securing unity and harmony in the relation of the Gas Fire with any particular coal grate surround, the "ENTENTE" Fire meets the case. This fire is designed to register accurately with any modern interior and to harmonise with the most artistic Mantel Register. The illustration shows the "ENTENTE" fitted in a modern interior.

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Nottingham Gas Undertaking.

Considerable dissatisfaction having been occasioned in Nottingham regarding the indifferent quality of gas supplied from the Corporation works, a resolution was passed at the December meeting of the City Council requesting the Gas Committee to give the matter special consideration and bring up a report, which was to be presented yesterday. This report points out that the conditions relative to coal supplies, which are the main cause of the trouble, have by no means improved recently. As a matter of fact, the Committee declare, the position is worse than it was a month ago; and the Government departments responsible for coal supplies and railway transport have definitely informed the Committee that steps should be immediately taken to curtail the supply of gas for public lighting or ordinary purposes. A deputation consisting of the Chairman (Alderman A. Ball), Councillor H. G. Ford, and the Engineer (Mr. John Wilkinson) have interviewed the Parliamentary Secretary of the Ministry of Transport, and laid the difficulties before him. The Committee do not intend to carry out the suggestions of the departments concerned until it is absolutely certain that their coal supplies will fall short of actual requirements; but it is clear that any proposal further to improve the quality of gas cannot be entertained until better supplies of coal are available. It may be noted that the total stock of coal at the gas-works, including the coal-built retaining walls, is only 3361 tons, which is less than six days' "requirements."

New Ross Lighting.—At a meeting of the New Ross Urban District Council, alternative tenders were submitted by the Gas Company for the lighting of the town by gas and by gas and electricity combined. The latter was accepted. Each tender was subject to conditions as to coal supply and changes in wages. A suggestion had been made that the matter be allowed to stand until the new Council were elected at the end of January; but it was pointed out that this might involve some liability in the event of accidents. Mr. J. Murphy said the new Council would have to consider soon whether they should not acquire the lighting undertaking.

Leicester's Reduced Pressure.—Under present abnormal conditions as to coal supplies, the Leicester Corporation Gas Committee have been driven to adopt drastic measures in the form of reducing the gas service to a minimum pressure. Referring to initial experiences of the change, which took effect last Tuesday, one of the principal local newspapers observed that the "general effect was not so bad as might have been expected." The street lighting was reduced by one-half, so far as the number of lights was concerned; but there was quite a reasonable amount of illumination. The Gas Engineer (Mr. Hubert Pooley) has indicated that, as a result of the reduction of pressure, there has been naturally a very large saving; and he anticipates that, unless something unforeseen occurs, the department will be able to carry on until the daily supply of coal again covers the normal demand for gas, which usually happens about the beginning of March.

Newcastle Gas Company's Enterprise.

Referring to local gas matters, the "Newcastle Daily Chronicle" says that the prospects of the Newcastle and Gateshead Gas Company, from the point of view of development of permanent consumption, are extremely bright for the coming year. Steps are being taken to develop the many industrial uses of gas, while in connection with the housing schemes provision is being made in all local cases for the installation of gas lighting, gas cooking, gas-washing coppers, or gas-fires in sitting-rooms and bedrooms. The Company are also bringing out a unique fitment for houses where space is meagre. It is a gas-heated clothes-drying closet. The mangle is stored in the cupboard except on washing days, when rods are placed across the cupboard for the hanging of clothes to dry by means of a protected gas-burner at the foot of the cupboard. In regard to lighting, recent inventions of heat resisting glass and better burners put the Company in an improved competitive position for both indoor and outdoor lighting. The use of high-pressure gas lighting for business premises had just commenced to be developed; and now that the restrictions have been removed, its use will be greatly extended. The mains are being extended; and in 1920 the Company will be supplying gas to Birtley through the Birtley Iron Company, who will be the distributors. The export trade for gas coke is promising well. The high prices which have been obtained have resulted in keeping the charge for gas from being further increased; and while the price of coal advanced by about 140 p.ct., the price of gas only increased 60 p.ct. The Company recently erected a bye-product works at St. Anthony's, where the whole of the tar is distilled—it having previously been sold as crude tar, and distilled by the buyer at Sunderland. Only about half-a-dozen products are being obtained at present; but the plant is being extended so as to recover several others.

The Chemical Engineering and Wilton's Patent Furnace Company, Ltd., have within the past week received orders for two complete installations of sulphate of ammonia plant of their 3 to 4 tons per day size—one for the Londonderry Gas Company, and the other for the Wolverhampton Gas Company. Both these installations are Wilton's sulphate of ammonia plant, with closed saturators and automatic dischargers, and have been ordered complete with all the modern devices which the Company have designed for labour saving and improvement in the quality of the sulphate, so as to manufacture neutral sulphate of ammonia to comply with the requirements in the near future. In both cases there have been included automatic means of conveying the neutral sulphate of ammonia from the plant to store. While mentioning these new sulphate of ammonia installations, it may be added that the Company's patent apparatus for making sulphate of ammonia neutral is in demand at many works, as they are now able not only to fit out the large undertakings, but by a separate apparatus they have designed they are able to offer the same facilities to the smallest gas undertaking at a cost which, it is claimed, pays them to instal it, as well as enabling them to supply the best sulphate of ammonia.

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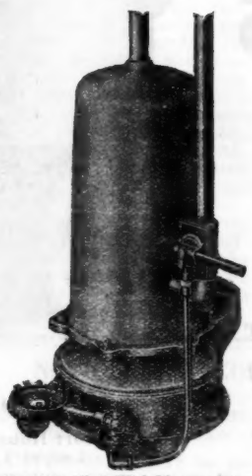

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STOCK MARKET REPORT.

LAST week the Stock Exchange old year closed and the New Year opened with all the firmness of markets and general cheerfulness which had characterized the preceding week. This was shared to a greater or less degree by almost all classes of security, although the motive power might not be identically similar. Anyhow, in all quarters there was a forecasting of improving conditions.

The gilt-edged market was strong, though Home Government issues were not conspicuous in advance, and the closing marks of the leaders were but fractionally higher—viz., Consols 50⅞-51¼, War Loan 91⅜-91 17/32, Funding 75½-76½, Victory 80¼-81. Indian and Colonial, however, advanced.

In Home Rails, the recent demand was fully maintained, and prices pressed steadily upwards in view of the imminent increase of goods rates. Canadians were in better case; but Argentines still hung fire in fear of labour troubles. The Foreign Market tendency was for the most part dull. French Loans were easier on exchange; and Russians were, of course, outside contemplation. Greek, Japanese, and Brazilian were fair.

The Miscellaneous Market was full of strong points. There was a great run on Rubber, and prices rose freely; and the same may be said of Oil. The demand for Textiles was very strong; and among other firm lines were Shipping and Iron and Steel.

Business in the Gas Market was on the whole quiet, and prices were for the most part unchanged. Variations in the quotations were principally *ex div.* adjustments. Bargains were mostly in Imperial Continental, which rose 1, and in Primitiva. The latter was much moved by a cablegram from Buenos Aires announcing the ratification of the new municipal contract; and prices rose freely. Later advices appear to have modified the earlier, and prices underwent a check. But on Friday they started again, and scored a fresh advance.

Bargains done for cash during the week were as follows: On Monday, Alliance and Dublin debenture 60, Gas Light ordinary 57½, ditto preference 66, ditto debenture 50⅜, 51, Hong Kong 9½, Imperial Continental 136½, 137, 137½, 138. Primitiva 32s. 6d., ditto preference 62s. 6d., 64s. 9d., 65s., 66s. 3d., River Plate debenture 50¼, 50⅜, South Metropolitan 57⅞, 57⅝. On Tuesday, European 10, Gas Light ordinary 54, 57, 57½, ditto preference 65, Hong Kong 9½, Imperial Continental 136½, 137, 137½, 137⅞, 138½. Primitiva 32s., 35s., ditto preference 65s. 6d., 67s., 67s. 6d., 70s., 72s. 6d., South Metropolitan 57½, ditto debenture 50⅝, 51. On Wednesday, Brentford "B" 53, 54, British 26½, European 10½, 11, Gas Light ordinary 57. 57½, ditto preference 65, Imperial Continental 137, 137½, 138¼, ditto debenture 83⅝. Primitiva 36s. 3d., ditto preference 72s. 6d., 75s., 75s. 7½d., 77s. 6d., ditto debenture 71, Harrow and Stanmore 5 p.ct. 68½. On Thursday, the Exchange was closed. On Friday, British 26, European 10⅝, 10¾, Gas Light ordinary 56½, 57, 57½, ditto maximum 44, Imperial Continental 138⅜, 139, ditto debenture 83, Primitiva 37s. 6d., 38s. 9d., 40s. 7½d., 42s. 6d., 43s. 6d., 45s., ditto preference 73s 9d., 75s., 77s. 6d., ditto debenture 70¼, 71, 71½. South Metropolitan 57, 57½, 57⅝, Colombo 5 p.ct. 1920 debenture 95.

In the Money Market, there was a strong demand for the requirements of the year's end; but with the turn of the calendar and with the release of abundant supplies, the position became extremely easy. The Bank rate is 6 p.ct., as fixed on Nov. 6, 1919.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue. £	Share	When ex-Dividend.	Ante War Dividend & Bonus. p.c.	Last Dividend.	NAME.	Closing Prices, July 28, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
189,049	Stk.	July 31	4	4%	Aldershot 4 p.c. Pref.	..	60—65	..
1,551,868	"	Sept. 26	9½	11%	Alliance & Dublin Ord.	52—54	45—50	..
974,800	"	July 11	4	4%	Do. 4 p.c. Deb.	76—79	62—64	60
280,000	5	Oct. 30	7½	8%	Bombay, Ltd.	53—54	5—5½	..
80,000	10	Aug. 28	18	12%	Bournemouth Gas and Water { 10 p.c.	20—30	19—20	..
888,110	10	"	7	7%	B ¶ p.c.	15—15½	10—11	..
116,000	10	"	6	6%	Pref. 6 p.c.	13½—14	9½—93	..
159,740	—	Dec. 30	—	4%	4 p.c. Deb.	..	64—70*	..
999,045	Stk.	July 11	14	37/-	Brentford A Consolid.	261—266	56—61	..
784,220	"	"	11	31/8	Do. B New	204—209	52—57	55—54
55,000	"	"	5	5%	Do. 5 p.c. Pref.	109—111	76—79	..
221,490	"	Dec. 11	4	4%	Do. 4 p.c. Deb.	91—93	64—66	..
214,775	"	Sept. 11	11	7½%	Brighton & Hove Orig.	205—210	123—128	..
344,400	"	"	8	5½%	Do. A Ord. Stk.	154—159	84—89	..
988,500	Stk.	—	5	5%	Bristol 5 p.c. max.	..	..	..
530,000	20	Sept. 26	12½	10%	British	44—45	25—27	26—26½
120,000	Stk.	Dec. 30	4	4%	Do. 4 p.c. Deb. Stk.	88—90	61—65*	..
245,771	"	"	4	4%	Buenos Aires 4 p.c. Deb.	85—87	47—50*	..
100,000	10	—	—	—	CapeTown & Dis., Ltd.	1½—2½	1½—1¾	..
100,000	10	Oct. 30	—	4½%	Do. 4½ p.c. Pref.	5—6	3½—7	..
100,000	Stk.	Dec. 30	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	55—63*	..
157,150	"	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	..	..
1,513,280	"	Aug. 14	5/9/4	33 4	Commercial 4 p.c. Stk.	106—108	56—61	..
580,000	"	"	6½	26/8	Do. 3½ p.c. do.	102—103	53—57	..
475,000	"	Dec. 11	8	5%	Do. 3 p.c. Deb. Stk.	69½—71½	49—51	..
800,000	"	"	4	—	Continental Union Ltd.	75—79	30—35	..
200,000	"	"	7	—	Do. 7 p.c. Pref.	115—118	40—60	..
51,600	Stk.	Aug. 28	14½	12%	Croydon A 10 p.c.	..	135—145	..
178,400	—	"	11½	9%	Croydon B and C ¶ p.c.	..	95—105	..
492,270	Stk.	"	6	6½%	Derby Con. Stk.	132—135	..	..
55,000	"	—	4	4%	Do. Deb. Stk.	102—104	..	..
1,009,180	10	July 30	10	5/0	European, Ltd.	17½—18	10—11	10—11
15,298,975	Stk.	"	4/17/4	80/-	Gas Light & Coke { 4 p.c. Ord.	98—103	58—59	54—67½
2,500,000	"	"	5¼	26/8	5¼ p.c. max.	76—79	44—46	44
4,062,235	"	"	4	4%	4 p.c. Con. Pref.	96—99	64—67	65—66
4,074,850	"	Dec. 11	8	8%	3 p.c. Con. Deb.	72½—74½	50—53	50½—51
150,000	"	"	10	10%	16 p.c. Bonds	..	..	..
92,500	"	Sept. 11	5	4½%	Hastings & St. L. 5 p.c.	87—89	57—62	..
268,740	"	"	8½	2½%	Do. 8½ p.c	40—45	40—45	..
70,800	10	April 29	11	7%	Hongkong & China, Ltd.	15½—16½	8½—9½	9½—9½
66,600	Stk.	Aug. 28	9	8½%	Hornsey ¶ p.c.	..	90—95	..
131,000	"	Sept. 11	7½	5½%	Ilford A and C.	151—154	88—98	..
55,750	"	"	6½	4½%	Do. B	115—118	67—72	..
55,660	"	Dec. 30	4	4%	Do. 4 p.c. Deb.	92—94	59—63*	..
4,940,000	"	May 14	9	4½%	Imperial Continental	156—160	135—140	136½—139
1,125,000	"	Aug. 14	8½	8½%	Do. 8½ p.c. Deb. Red.	84—86	81—85	83—83½
285,949	"	Sept. 11	6½	6½%	Lea Bridge Ord. 5 p.c.	119—121	86—91	..
2,495,998	"	Feb. 26	10	42/6	Liverpool 5 p.c. Ord. { A	211—213	..	..
806,088	"	June 26	4	4%	Do 4 p.c. Pr. Deb. Stk.	146—148	..	..
165,750	"	Aug. 14	7/5/6	32½	Maidstone 5 p.c.	..	..	..
75,000	5	June 11	5	5%	Malta & Mediterranean Met. of { 4½ p.c. Deb.	..	55—61	..
250,000	100	Oct. 1	4½	4½%	Melbourne {	4½—4¾	1½—2½	..
541,980	Stk.	Nov. 27	4	5%	Monte Video, Ltd.	90—101	90—97	..
1,575,878	"	July 30	4½	3½%	Newcastle&Gatsh'd Con.	11½—13	78—78	..
539,705	"	June 27	5½	5½%	Do 5½ p.c. Deb.	98½—99½	69—70	..
15,000	10	Sept. 11	—	11½%	North Middlesex 10 p.c.	81—82	67—68	..
66,949	10	"	7/14/0	7%	7 p.c.	..	18½—19½	..
800,000	Stk.	Nov. 27	5	5%	Oriental, Ltd.	14—15	8—9½	..
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	117—129	102—105	..
60,000	50	Aug. 28	12	7½%	Portsea, Island B	7½—7¾	4½—5½	..
100,000	50	"	12	6½%	Do. C	125—131	86—88	..
949,980	5	April 29	5	—	Primitiva Ord.	118—121	84—87	..
499,950	5	June 26	5	—	Do. 5 p.c. Pref.	5½—6	1¾—2½	33/—45/-
521,800	100	Dec. 1	4	4%	Do. 4 p.c. Deb.	4½—5	3½—4	62/6—77 6
600,000	Stk.	July 30	4	4%	Do. 1911	91—93	70—72	70½—71½
846,198	"	Dec. 30	4	4%	River Plate 4 p.c. Deb.	..	49—52	..
150,000	10	Sept. 26	5	5/-	San Paulo { 6 p.c. Pref.	85—87	47—50*	50½—50¾
125,000	50	Dec. 30	5	5%	5 p.c. Deb.	10½—11	7½—8	..
125,000	Stk.	Aug. 28	10	5%	Sheffield A	4½—49	39—41*	..
909,984	"	"	10	5%	Do. B	228—234	75—80	..
598,500	"	"	10	4½%	Do. C	228—234	75—80	..
133,201	Stk.	Sept. 12	4	4%	Shrewsbury 5 p.c.	220—222	75—80	..
90,000	10	Oct. 15	9	10%	South African	..	..	..
5,609,995	Stk.	Aug. 14	5/4/0	80/-	South Met. 4 p.c. Ord.	16½—11½	12—13	..
250,000	"	July 11	—	5%	Do. Pref.	111—113	56—59	57—57½
1,895,445	"	"	8	8%	Do. 5 p.c. Deb.	..	94—96	..
234,890	"	Aug. 14	8½	5%	South Shields Con. Stk.	73½—74½	51 54	60½—61
959,795	"	"	6	3½%	S'th Suburb'n Ord. 5 p.c.	157—160	104—106	..
187,558	Stk.	Dec. 30	5	5%	Do. 5 p.c. Deb. Stk.	114—116	68—73	..
647,740	"	Nov. 18	7½	3½%	Southampton Ord.	115—118	78—83*	..
121,275	"	Dec. 30	4	4%	Do. 4 p.c. Deb. Stk.	99—102	61—68	..
120,000	"	Aug. 14		4½%	Tottenham { A 5 p.c.	..	61—68*	..
782,275	"	"	6	3%	District { B 3½ p.c.	135—138	70—75	..
181,255	"	Dec. 11	4	4%	4 p.c. Deb.	115—117	50—55	..
189,880	10	Dec. 30	5	—	Tuscan, Ltd.	87—89	63—66	..
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	5—6	1—2	..
236,476	Stk.	Sept. 26	5	3½%	Tynemouth 5 p.c. max.	93—95	45—60	..
					Wandsworth, Wimbledon, and Epsom—	106½—109	74—76	..
30,000	"	Aug. 28	2½	55/-	Wandsworth A 5 p.c.	151—156	85—90	..
256,686	"	"	6½	40/-	Do. B 3½ p.c.	129—134	63—68	..
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H. WIMHURST,
Engineer and Manager.
Sleaford,
Dec. 31, 1919.

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Applications, stating Age, Qualifications, and Experience, with *copies* of Two recent Testimonials, to be sent to the undersigned not later than Jan. 22, 1920.
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Hyde.

THE Directors of The Sittingbourne District Gas Company invite Applications for Appointment as ENGINEER and MANAGER. Applicants must be good Practical Carbonizers, efficient in the Manufacture and Distribution of Gas and Production of Residuals (including Sulphate of Ammonia), Competent to Superintend Extensions and Improvements, Capable of Handling Workmen, and, preferably, with knowledge of Construction and use of Electrically-Driven Stoking Machinery.
Applications, endorsed "Engineer," stating Age, Qualifications, &c., and Salary required to commence, with *copies* of recent Testimonials, to be addressed to the undersigned by the 24th inst.
A. P. GHENT,
Secretary.
8, Crescent Street,
Sittingbourne,
Jan. 1, 1920.

URBAN DISTRICT COUNCIL OF HINDLEY.

THE Urban District Council of Hind- LEY invite Applications for a Competent GAS and WATER ENGINEER and MANAGER, to have Control of the Gas and Water Departments of the Council. Salary, £350 per Annum, and person appointed to devote the Whole of his Time to the Duties.
Applicants to state Age, whether Married or Single, Qualifications and Experience, and to forward not less than Three *copies* of recent Testimonials as to Character and Ability.
The annual make of Gas is 90 Millions.
Canvassing Members of the Council will be considered a Disqualification.
Applications to be forwarded to the undersigned, endorsed "Gas and Water Engineer," not later than 12 o'clock noon, on Monday, the 26th of January, 1920.
By order,
THOMAS ROBEY,
Clerk to the Council.
Council Offices,
Hindley,
Dec. 29, 1919.

THE Romford Gas and Coke Company, Ltd., require the Services of a DISTRIBUTION SUPERINTENDENT to Take Control, under the Company's Engineer, of the Distribution Department.
Applicants must be Experienced in all up-to-date Methods of Distribution, to Take Control of Showroom, and Direct the Work of Fitters, &c., and be capable of giving Estimates, and of Advising Consumers in the use of Modern Gas Appliances.
Applications, stating Age, Experience, (accompanied by *copies* of Three recent Testimonials), Salary required, to be sent to the CHAIRMAN, Romford Gas and Coke Company, Ltd., NURSERY WALK, ROMFORD, Essex, endorsed "Distribution Superintendent," on or before Jan. 13, 1920.
J. C. WRIGHT,
Engineer and Manager.
Works and Offices,
Nursery Walk, Romford.